FOOD INDUSTRIES

manufacturing and processing

McGRAW-HILL PUBLISHING COMPANY, INC.
JAMES H. McGRAW, *Chairman of the Board*
MALCOLM MUIR, *President*

H. C. PARMELEE, *Editor*

M. A. WILLIAMSON
Publishing Director

New York, July, 1929

VOLUME I . . . NUMBER 10

Fish Industry Makes Higher Value Byproducts

FISH byproducts have for many years been disposed of in the fertilizer industry, and to the advantage of both producer and user of these incidental materials. Now, however, the fish packers are discovering an outlet for scrap and oil as feed stuffs. This use promises a higher return on the byproducts of the seafood packers and a larger economic service to the community as a whole.

Several government investigations have been in progress during recent years which clearly indicate that crab scrap, menhadden fish meal, and like products, if properly prepared, are extremely valuable for feeding poultry and various types of farm animals. One set of results indicates a doubled egg yield from hens fed with crab scrap in supplement to their other standard food ration. Similar benefits have been found through application of waste fish oils and other fish products.

There is not sufficient available animal feed of high-vitamin content in the United States to permit these especially valuable fish foods to be wasted. It is a matter for congratulation therefore that the fish packing business is finding it profitable to furnish feed stuffs in form suitable for farm consumption.

The Pending Tariff

BETWEEN now and August 19, when the Senate committee of which Reed Smoot is chairman is to have the new tariff bill ready for further discussion and definite action by both House and Senate, much can be done by those interested in the various fields of food manufacture. As it now stands, the Smoot-Hawley bill has aroused considerable hostile press criticism because of its having included many tariff increases that will inure to the advantage of others than the farmers—for whose benefit the special session was called.

During the past few weeks the economics of tariff making have been discussed by many writers from the point of view of the necessity of considering the situation as a whole before deciding upon any changes whatever, no matter how slight they may be. Perhaps the most significant material of this sort is the recent League of Nations report on "Sugar," obtainable from the World Peace Foundation, of Boston, in which that most important foodstuff is discussed fully, impartially, and authoritatively by three of Europe's leading economists.

On the same subject there is available from the National City Bank of New York its June letter on economic conditions, wherein eleven pages are devoted to a recital of the dire results that will ensue should we raise the duty on Cuba's chief export. Something was heard of this possibility from a Washington press bureau earlier in the legislative year, but in no way as convincing a fashion as is this plea for "live and let live" by one of our largest banking institutions.

Of a more general nature is the contribution of Alfred P. Dennis, vice-chairman of the United States Tariff Commission, to the June 15 issue of *The Saturday Evening Post*. This is based upon the postulate that "cold statistics are worth any amount of soap-box oratory when it comes to reckoning profit or loss on a business transaction." The author's text of "Tariff—a Two-Edged Sword" is well detailed and documented with a wealth of material in great measure having to do with agricultural products of one sort or another. Mr. Dennis pleads for the exercise of foresight in the present situation, lest our efforts to help a part of our farmers result in relatively widespread harm to the body politic—harm that is plainly discernible to all who have the patience to study a few sets of contrasting statistics.

Spray Drying Offers Possibilities for New Foods

SPRAY-PROCESS drying has both suffered and profited by its long confinement to the drying of milk products. It has been looked upon as a tool peculiar to the dairy field and of limited or no application to the food manufacturer generally. On the other hand, drying milk has enabled a continuous study to be made of the process on a product easily dried, of fairly constant composition, and in which the quality of the finished product could be easily determined. The success of the method in the dairy field is demonstrated by the increase in the production of dry skim milk in the United States from 16,460,000 pounds in 1916 to 91,720,000 pounds in 1926.

Much work is still possible on dairy products. Spray-drying of skim milk and buttermilk is well established, as the figures previously given show, but much remains to be done in the way of increasing the use of these foods and in finding new uses for them. Many people even yet are not acquainted with this product and some are not even aware of its existence. Many of the difficulties in the keeping quality of dried whole milk are still

unsolved. Powdered ice cream mix is a problem still awaiting successful solution. Millions of gallons of whey are still being poured into sewers each year. All of these are opportunities for profits to the manufacturer who will prosecute investigation toward the solution of the problems involved.

All food manufacturers whose products lend themselves to the procedure should find development and exploitation of dehydrated foods worthy of consideration. In this connection dehydrated fruit juices immediately suggest themselves. Unfortunately, fruit juice solids usually are so hygroscopic that it is often impossible either to obtain a dry product or to keep it dry if obtained. Again, the delicate flavors of fruit juices usually disappear on drying. By using "adjuvant" substances, however, to borrow a medical term—such as milk, eggs, glucose sirup, malto sirup or other colloidal materials—the product may be successfully dried and the flavor surprisingly well preserved. Research in this direction is worthy of more vigorous application than it has so far received.

The spray-drying process is not limited to thin liquids alone. Equipment manufacturers have perfected devices which will atomize very stiff and viscous liquids and by so doing have opened up new possibilities for the spray process. By disintegrating with a colloid mill or homogenizer either raw or cooked vegetables, such as potatoes, squashes, turnips, and such pulpy fruits as bananas, plums, apples and the like can be made into thick liquids which give fruit or vegetable "flours" on spray drying. This method should be capable of wide application and should produce some highly nutritious and palatable additions to our diet.

Manufacturers who have sub-standard or byproduct materials which are available only for animal food may find spray-process drying a means of turning a nuisance into a profit. Much of the low-grade or highly acid skim milk, buttermilk and whey finds its way into this channel. A few meat packers make spray-dried soluble blood for animal foods and markets probably could be found for much more.

Spray-process drying offers the possibility of utilizing waste products as well as developing new products. It is a tool that should not be lost sight of.

The Passing of the "King of the Drawback"

THROUGH the efforts of the Canners League of California, the Northwest Canners Association and the California sugar refiners a provision has been inserted in the new tariff bill that will greatly simplify the matter of filing drawback claims on re-exported merchandise, and may obviate the clerical post that in some concerns has often been humorously called the "King of the Drawback."

Under the old law it is necessary to prove that the particular export shipment was made from the goods imported on a specified date and that a definite amount of duty had been paid on them. It is then necessary to trace the identity of the goods all through the manufacturing operations, but to do it beyond the possibility of a doubt has often been an arduous task—unavoidable if a refund of duty were to be collected. Frequently it has necessitated special runs of goods, specially segregated and identified, particularly when sugar is involved, in order to substantiate the claim for refund of duty, and has caused considerable bother to manufacturing departments as a result. For example, a milk condensary may desire to export sweetened condensed milk from an existing stock of goods, but, due to the exigencies of the law, may find it necessary to make a special run, using drawback sugar to fill the order, so that the proper papers can be made out.

Under the new law it will not be necessary to trace the identical sugar or tinplate, as the case may be, provided the exporter can show that he imported these supplies in an amount as large as the amount for which drawback is claimed. The provision of the bill deserves the same support that has been given to any of the simplified practices on the program undertaken up to the present by the Department of Commerce.

Expanding Food Markets by Quality Standards

A DECLINE in meat consumption in the United States is blamed by a marketing specialist of the government upon inadequate standards for meat. Without undertaking to say whether Dr. C. E. Gibbons, of the Bureau of Agricultural Economics, who is responsible for this conclusion, can unquestionably substantiate his thesis, we do believe that his statement refers to a fundamentally sound principle of food production and one that is all too often ignored.

Dissatisfaction with a can of peas results not alone in criticism of the particular brand involved. It results also in a tendency on the part of the housewife to buy something other than peas next time she wishes a vegetable. In a word, inferior quality of food product hurts not only the producer responsible. It hurts all of the industry from which this product comes.

The food industries of the United States are only now beginning to be so organized that they can work as complete industrial units in matters of national importance. The formation of effective trade associations has for the first time given a real tool by which to hew out a constructive and effective policy for all producers and merchandising elements of any particular commodity group.

Some of these trade organizations have already recognized their opportunity for serving their industries, as well as for public service, through establishment of quality standards. More groups must recognize this opportunity and this duty. Through the voluntary adoption of standards, and voluntary compliance therewith, public good will can be fostered and a basis laid for permanent profits. We commend for the study of all food groups the conclusion of Mr. Gibbons which is referred to.

An Invention of Doubtful Value

USERS of dried beans should be particularly interested in patent No. 1,707,360, recently granted to John H. McFarland, which is briefly described elsewhere in this issue. From its date of application, March 28, 1927, it appears that the idea has been in existence for more than two years. The interest in this patent lies in the fact that frosted and water-soaked beans may be bleached out to simulate the appearance of normal beans and that this invention, therefore, imposes a further burden on the purchaser of this raw material.

Slightly damaged beans, heretofore, have carried their

own tell-tale evidence, but with the advent of this invention the evidence can be removed. We have no knowledge of its commercial utilization but urge canners in particular to exert unusual care in looking for reconditioned stock that may be submitted for purchase.

In this connection it is well to remind our readers of a comparatively simple test that can be used to detect moldy beans regardless of any polishing or bleaching to which they may have been subjected. If the beans are split open and the inner flat surfaces of the cotyledons examined with a microscope of 450 magnifications the mold filaments can be seen. The test is applicable to dry beans, soaked beans, or canned beans. All that one needs is the microscope and ability to recognize mold when he sees it.

What Americans Eat

IN THE fact-finding survey of post-war developments conducted by the National Bureau of Economic Research and interpreted by the Committee on Recent Economic Changes of the President's Conference on Unemployment, of which Herbert Hoover, then Secretary of Commerce, was chairman, the opening chapter is devoted to consumption and the standard of living. This section was contributed by Leo Wolman, an authoritative economist, whose findings and conclusions as to trends in present-day dietary habits may well be respectfully regarded by all of us.

In discussing the cost of living the topics Dr. Wolman treats are food, manufactured goods, the automobile, residences, and rural conditions. Of these, the 27 pages devoted to food consumption will no doubt be read with interest by every food manufacturer, so pregnant are they with suggestions well buttressed with documentary material.

On the basis of the survey, malnutrition is still with us, though to an extent not easily measured; the trend thereof seems to be downward. Dr. Wolman reminds us that our food requirements are continually growing less in terms of calories, a fact due, obviously, to the passing of the pioneer stage with its accompanying call for muscular exercise in the open air.

Using as his point of departure the findings of Raymond Pearl, as published in *The Nation's Food,* 1920, Dr. Wolman summarizes the present situation, in terms of tendencies merely, to the effect that there have been declines in our consumption of cereals, notably wheat and corn, with accompanying increases in the consumption of dairy products, vegetable oils, sugar, and miscellaneous vegetables and fruits. Official estimates for meat and lard would seem to indicate a slightly higher average for the last six years than for the period 1911-1917, although the data is not entirely reliable.

Our use of cereals—wheat flour and corn meal—fell more than 40 per cent in the 30-year period 1889 to 1919, or from a daily average consumption of 1,537 calories to 901 calories. Since 1919 there have been slight increases in quantities consumed, although the figure for 1925 was a bit lower than that for 1919. Dr. Wolman concludes that there are no present indications favoring the re-establishment in popular favor of our staple cereals. Reasons for the lessened consumption of cereals and their products include the rising level of per capita incomes and the decline in energy requirements, although mention is made of possible other influences—war propaganda, discontinuance of free portions of bread at restaurants, dietetic criticism of white flour, advertising bread as the "cheapest" food, and changing proportions of waste.

Of animal products our diet constantly makes use of less beef, mutton and lamb, and of more pork and lard, although the drop in consumption is by no means comparable with the waning demand for our principal cereals. For the period under scrutiny consumption of poultry increased substantially, both in amount and in prices received by the producer. The demand for eggs did not keep pace with the growth of population, nor did prices to egg producers keep pace with the prices of foods in general.

Of dairy products we are using a constantly increasing amount. There has been an increase of nearly 50 per cent in the total consumption of fresh milk and of nearly one-third in the per capita consumption of fresh milk. Of products manufactured from milk, there were post-war increases of about 23 per cent in the case of butter, 27 per cent in cheese, 32 per cent in condensed and evaporated milk, and over 45 per cent in ice cream. The percentage of milk manufactured is a smaller fraction of the whole than was the case seven years ago.

Of butter and margarine considered jointly, the net increase between 1919 and 1926, in terms of calories per capita, was about 12 per cent, or 1 per cent more than the growth in population. Prior to the war vegetable oils usually furnished about one-third of the total fatty ingredients of margarine. At present the proportions are reversed, with emphasis on coconut oil rather than cottonseed oil. The consumption of margarine during the period studied ranged from 3.22 pounds per capita per annum to 1.64 pounds in 1922, rising in 1926 to 2.32 pounds per capita. Of vegetable oils used as shortenings and in cooking we now consume quantities equivalent to our lard exports. The use of vegetable oils, especially cottonseed oil, as salad dressings has assumed real magnitude. Dr. Wolman concludes that the increased use of vegetable oils is due largely to improved technology, supplemented by commercial advertising.

Our consumption of sugar in all forms is now well over 110 pounds per capita. Bread, cake, ice cream, and confectionery make use of constantly increasing amounts. Since 1888 we have more than doubled our per capita consumption, the increase since the last pre-war years being about 25 per cent. The present use of sugar is regarded favorably as to palatability, economy of effort, wastage, and healthfulness.

Our use of certain staple fruits and vegetables—apples, white and sweet potatoes, cabbage, onions—has increased relatively little, or not at all. For most other fruits and a number of vegetables the increase has been substantial, and certain items, such as celery, spinach, lettuce, carrots, and snap beans, have increased a great deal. These increases apply principally to fresh products rather than dried or canned. This increased consumption of fresh fruits and vegetables is a significant contribution to our diet.

In the judgment of Dr. Wolman, the level of sanitary conditions under which foods are processed and sold has risen, partly as a result of public inspection, partly in consequence of larger scale operations, and partly as an appeal to the consumer's desire for assurance on this score. In brief, the present diet, at least for city dwellers, may be termed the best in the history of the country. Furthermore, in the judgment of Dr. Wolman the American public spends for food a smaller percentage of its income than is the case in any other country.

Modern Manufacture of

MARGARINE

Requires Rigid Chemical and Bacteriological Control

By H. W. VAHLTEICH
The Best Foods, Inc., New York City

MARGARINE today is almost universally produced by churning the margarine oil-blend with carefully produced and maintained cultures of *B. acidus lacticus* and like cultures or blends thereof. The mixture, or emulsion, of milk and oil is then chilled, worked into a mass, salted and packaged.

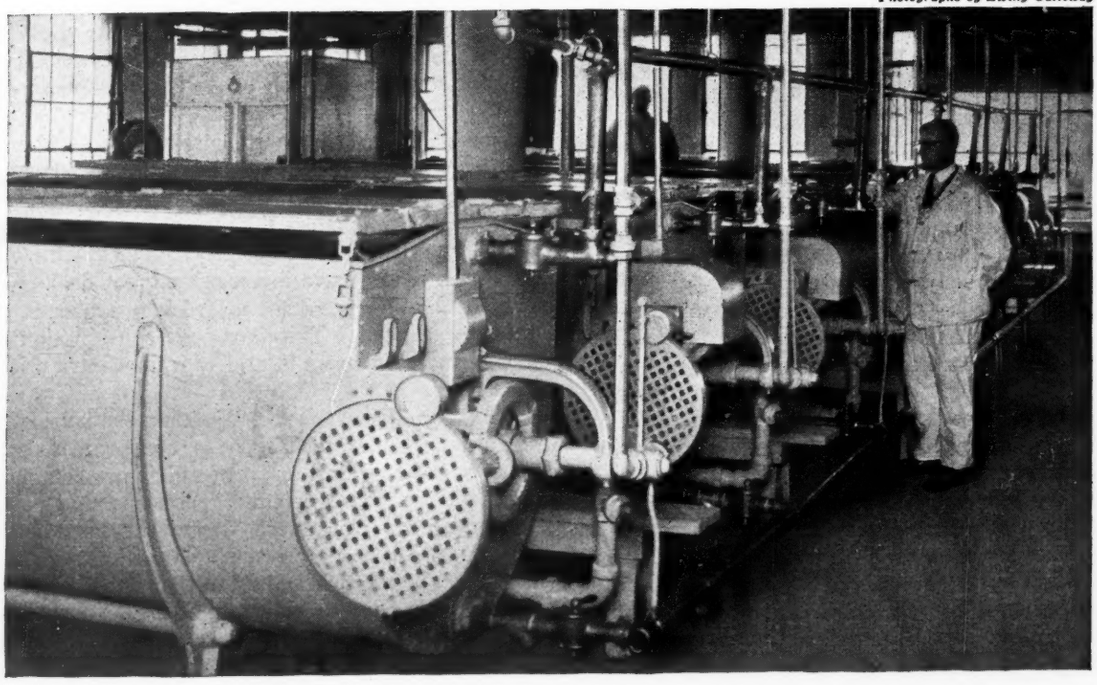
Four principal operations occur in the manufacture of margarine, as follows:

1. Preparation of the raw materials:
   (a) Preparation of the cultured milk
   (b) Preparation of the margarine oil.
2. Mixing or churning of oil and milk to produce the margarine emulsion.
3. Cooling of the emulsion.
4. After-treatment of the cooled emulsion:
   (a) Tempering
   (b) Working
   (c) Printing and wrapping.

The preparation of the raw materials, before they are even mixed to produce the margarine emulsion, calls for work of a highly specialized nature. The individual oils, previously refined by alkali and hydrogenated, are blended in proportions that will yield the required melting point; filtered; and passed on to the deodorizing plant for the important process of deodorization. The object of this latter process is to remove from the oil the last traces of crude-oil flavors and such traces of other flavors as it may have acquired in previous refining operations. The effort is to produce an oil possessing, as nearly as possible, no flavor whatever—an oil which may take up the choice flavor imparted to it by properly churning it with cultured milk and blending with salt without contributing any flavor of its own. The process of deodorization is carried out by blowing superheated steam through the heated oil in a vacuum for the period of time required to remove the undesirable flavors.

Battery of pasteurizing and ripening vats in milk room of modern margarine plant. Here milk is pasteurized and cultured, or "ripened," preparatory to churning it with margarine oil to produce margarine emulsion

Photographs by Ewing Galloway



In a well-managed margarine plant the quality of the oil about to be used for margarine is very closely watched and scored for flavor by critical men experienced in recognizing the faintest "off" flavor or odor. This scoring of margarine oils for flavor frequently amuses the skeptical novice who is seldom able to distinguish between oils that experienced margarine men will score as "good" and those that will be scored as "poor," but experience will soon indicate their experienced judgment when the margarine made from good oils is scored "fancy," or when that made from a poor oil is three weeks or a month later found to develop an undesirable flavor.

Milk Room Is "Soul" of Plant

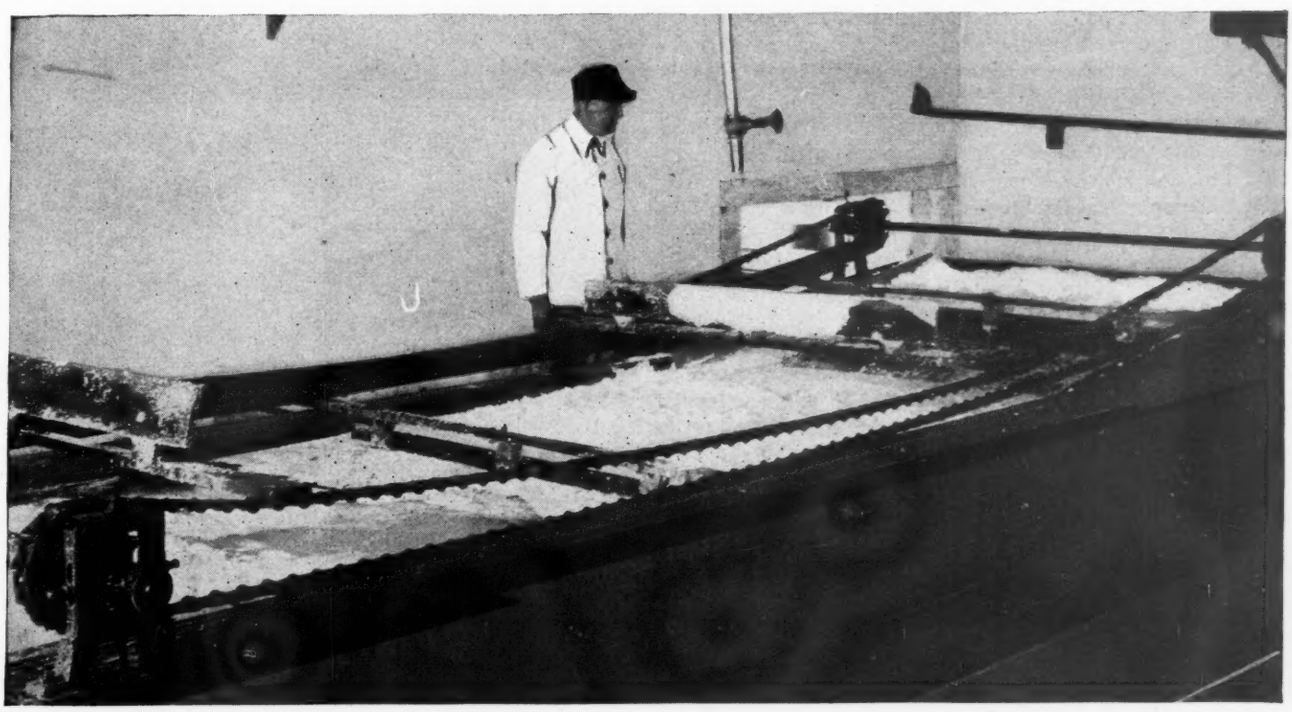
As already mentioned, it is quite generally recognized that the most desirable margarine oil is one having, as nearly as possible, no flavor whatever. On the other hand, the cultured milk to be used is developed with a view to producing a fine, butter-like flavor in the finished margarine. The milk room of the modern margarine factory is truly the soul of the plant. Here are maintained, in electrically controlled thermostats, the mother cultures which are used to grow the daily requirement of "starter," which, in turn, is added to the previously repasteurized milk in order to develop in this milk the particular culture desired.

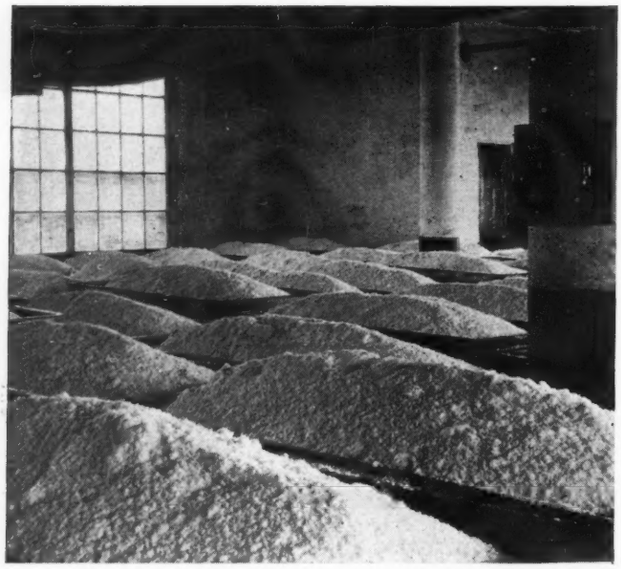
Briefly, the operations are carried out as follows: the "milkman," or man in charge of the milk room, maintains a number of mother cultures of, let us say, pure *B. acidus lacticus*. He grades and coddles these mother cultures much as an animal trainer cares for his trained performers. He transplants his cultures regularly and frequently flavors his products to assure himself of their qualities of flavor. It is of vital importance that each culture remain free of contamination by ad-

Upper portions of two "churns," where cultured milk and margarine oil are mixed. These are glass-lined, jacketed (for steam and water) containers fitted with agitators, with inlets for cultured milk and oil and outlets (below) for the emulsion, from which it is passed through the chill vat to solidify it, and thence to the trucks and the tempering room.

* * * *

Chill vat; the margarine enters at the end of the vat to the left in the picture. The water into which the emulsion is sprayed is kept a few degrees above the freezing point and also is kept in motion (from left to right in the picture) in order to pass the chilled (now solid) emulsion to the other end of the vat, where it is swept by the mechanical paddles into a waiting margarine truck. These paddles move from left to right below the surface of the water on which floats the chilled margarine emulsion.





A corner of the tempering room looking over the tops of a number of trucks of freshly chilled margarine emulsion where they are being held under controlled temperature preparatory to working and salting. This snow-like material is composed of the chilled margarine oil and cultured milk.

ventitious molds and bacteria of the air and that the culture remain pure.

Now when we speak of a pure culture of any bacterium the inference too frequently is that we are dealing with something closely akin to a "c.p." chemical. No such thing! Ayres and Johnson, in 1913, demonstrated that there are about a dozen different strains of *B. acidus lacticus* each having a different thermal death point ranging from about 60 deg. to as high as 78 deg. C. In all probability the margarine milkman recognized such a situation intuitively, for it is common knowledge to him that a number of cultures of *B. acidus lacticus* may all be "pure" and yet vary vastly in flavor. As one experienced milkman put it, a pure culture may be compared to a race of humans—say the white race, by way of illustration. Britons, Germans, French, Americans and Scandinavians, are all whites. Still, they are all different. So it is with strains of pure cultures of *B. acidus lacticus* used in margarine milk. The El Dorado of the milkman is a situation which includes a number of mother cultures any of which pleases him with regard to its capability of imparting a fine, delicate and lasting cultured milk flavor to margarine oil.

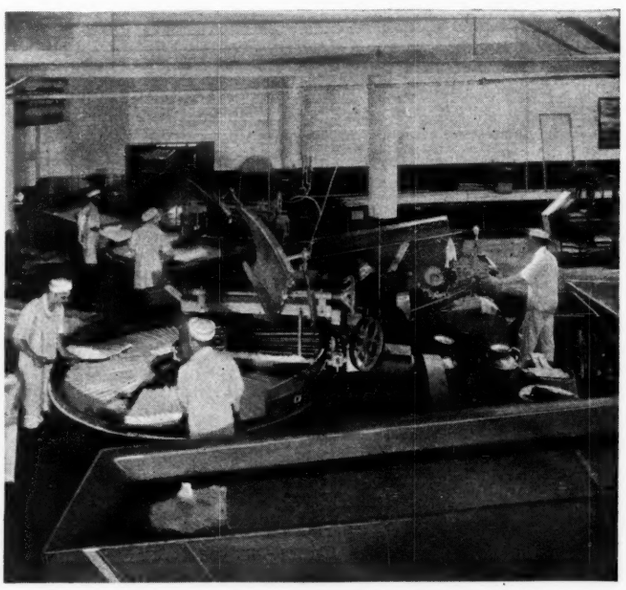
His mother culture carefully transplanted to a fresh bottle of milk, the milkman uses it to "seed" cans of fresh'y pasteurized milk. These are then kept at the optimum temperature found to produce the rate of propagation and degree of acidity required in a given length of time. The cultured milk is used as a starter for the several large lots of milk which have just finished the pasteurization operation. These in turn are maintained at the optimum temperature for the several hours required for the producton of the desired acidity; titrated and calculated as lactic acid, in the daily control; immediately chilled to check further bacterial development and at once churned with margarine oil. No small part of the management of the milk room in a large margarine plant consists in so arranging the pasteurization, culturing and chilling of the margarine milk as to have an adequate but not excessive supply of milk ready to use at the churn from time to time during the day.

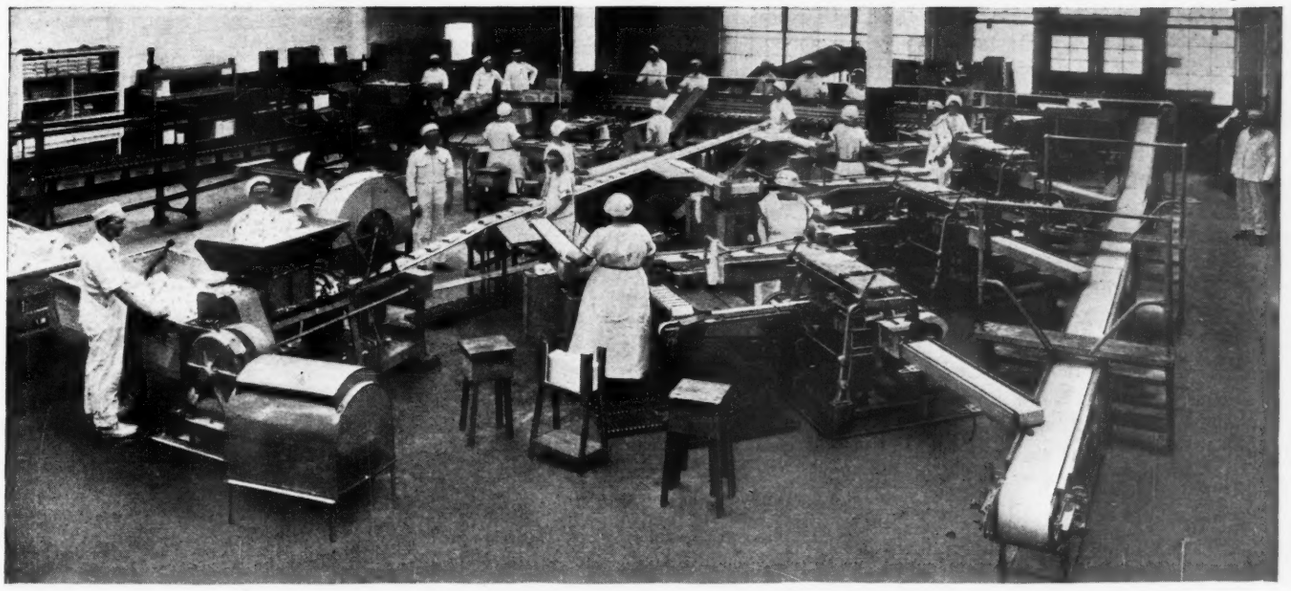
Adequate chemical control is an important factor for both milk and oil up to the point where they are churned together. Although milk usually is received pasteurized at the plant the careful margarine manufacturer not only repasteurizes but first makes a reductase test on all incoming milk. Likewise the acidity of the cultured milk is kept under careful control checked by titration in the milk room. Also the margarine oil is carefully watched not only for flavor but also for its content of free fatty acid, which seldom exceeds 0.04 per cent; its color (measured by the Lovibond scale), and for its response to the Kreis test, which must always be negative.

In the Kreis test the development of an immediate pink color between the oil and an ethereal solution of phloroglucin and hydrochloric acid indicates rancidity (probably oxidation and the simultaneous development of free fatty acid). The Kreis test must not (as is sometimes done by the uninformed) be carried out on a sample of margarine oil colored with permitted food colors like yellow OB or yellow AB, for these latter alone wll give a pink coloration with acid, thereby not only masking a true positive Kreis test but also falsely indicating a positive Kreis test when in reality the oil is negative to the test.

The churning operation is carried out in a variety of mixing vessels or "churns" as well as in the more modern homogenizers. Whichever, oil or milk, is present in large quantity in the churn and is being vigorously agitated at the time the other ingredient is passed in, will constitute the external phase of the margarine emulsion. For example, if the oil is already present in the churn when the milk is passed in, the oil will form the external or "continuous" phase of the margarine emulsion. Some manufacturers (see Clayton's monograph "*Margarine*") prefer to have the oil passed into the milk, the point being

Margarine working and salting machinery. Chilled emulsion in trucks is brought from the tempering room in the rear, shoveled onto the work tables with clean wooden shovels and, by revolving the entire table, the chilled emulsion and salt are passed under the corrugated roll until the kneaded margarine has become a plastic mass.





Printing, wrapping and packing margarine into 1-lb. cartons. At the left the finished margarine, which has just been worked and salted, is passed through a machine which forms a ribbon of white margarine cut into lengths weighing 1 lb. Next they move on a belt to the wrapping machines and, in turn, on other belts to the shipping room.

that in this way, with the aqueous milk serum as the external phase, the emulsion resembles cream in the manufacture of dairy butter. When a homogenizer is used the character of the emulsion is largely dependent upon the proportions of milk and oil passed through the machine in a given time—that is, upon the relative rates at which oil and milk are pumped into each other. In any event the object of the churning operation is the intimate mixing of oil and cultured milk.

From this point on there are two systems in use in the manufacture of margarine: the so-called dry and wet methods. Of these the latter is the older method. In it the margarine emulsion from the churn or homogenizer is passed into contact with cold water, whereby the emulsion is chilled or "crystallized" into a snow-like mass which is collected in trucks usually capable of holding 500 lb. or more. These are easily rolled into a constant temperature room where they are allowed to remain 16 to 24 hours before the "crystals" are at a temperature at which they are soft enough to work.

There are a number of methods in use for chilling margarine in the wet way, such as passing the emulsion into a large vat of ice-cold water from which the crystals are skimmed off into trucks, or by passing the emulsion down a trough against a current of ice water or, again, against a spray of ice water under pressure, and other similar methods.

There also are a number of modifications of "dry cooling" the margarine emulsion, but they all consist essentially of passing the emulsion over a chilled roll or drum, from which the solidified emulsion is scraped off by a knife and allowed to drop into the margarine truck used to convey it to the constant temperature room. By this system the margarine never comes into contact with the cooling water, which always requires rigorous control to avoid its being a source of contamination.

After 16 to 24 hours in the "tempering room," during which time the crystals are brought to a temperature suitable to their manipulation by working machinery, they are "worked" or kneaded to remove from them the excess water, to work in salt, and to render the mass sufficiently plastic for manipulation by printing and wrapping machines. This part of the process usually is arranged to make the best use of the force of gravity in passing the product from the tempering trucks successively to the various working machines in such a manner as practically to eliminate touching of the product by human hands.

Some of the equipment and machinery used, like the workers and blenders, is typical dairy butter equipment, while some of it, like the margarine truck, is quite characteristic of the newer margarine industry. The materials used for the margarine truck have varied widely; wood probably was the material originally most used, but it was soon found desirable to line the wooden truck wth heavily tinned sheet iron. This, in turn, has been replaced by the tinned solid sheet-iron truck and by the aluminum truck, which seems to have found considerable favor in Europe.

As a material for the chutes for the gravity conveying of crystals and worked margarine solid nickel has been tried and found to meet with satisfaction, although its initial cost is high.

Margarine printing and wrapping machines, while ingenious and efficient in operation, probably offer nothing more advanced than may be found in other well-developed packaging operations, with the exception of the equipment used to insert the color wafer into the almost finished package.

Margarines, as well as dairy butters, are susceptible to infection by a considerable number of common molds and bacteria of the air. Some of these organisms are able to utilize both fatty acids and glycerides interchangeably as a source of carbon; some are able to saponify glycerides, and some are responsible for undesirable flavors in other ways. Hence it becomes of importance to minimize the danger of infection by air-borne microorganisms. This can be effectively done by filtering all air entering the plant through some type of suitable filter such as the Reed filter. Such an installation should be

controlled and amplified with a simple system of bacteriological control such as exposure of petri dish plate cultures at the air delivery screens from the system and at various places throughout the plant. Mold and bacteria-count data gathered in this manner serve as an excellent criterion of the condition of the air in the plant, the condition of the incoming air, and as a means of indicating the most seriously contaminated areas in the plant when such occur.

Oleomargarine first came into prominence in 1870 as a result of the efforts of the Frenchman Mégés-Mouries, who was stimulated by conditions arising out of the Franco-Prussian War and by a prize offered by Napoleon III for the successful commercial production of a suitable butter replacement material. From the few hundred tons produced daily in France in 1875 the consumption of margarine has increased to several thousand tons daily throughout the world in recent years. Since its introduction into the United States about 1880 the production of margarine has increased to a maximum of about 360,000,000 lb. in 1920. Since that time there has been a dip and again a rise in the curve of margarine production in this country until it is expected that the figures for 1928 will approach those of 1920.

Kinds of Margarine Not Shown in Figures

The character of the margarine production, however, is not disclosed by these figues. While the general term "oleo" margarine is accepted by the public as covering all margarine, the trade distinguishes between "oleo" or animal-fat margarine, and margarines made from purely vegetable fats or "nut butter."

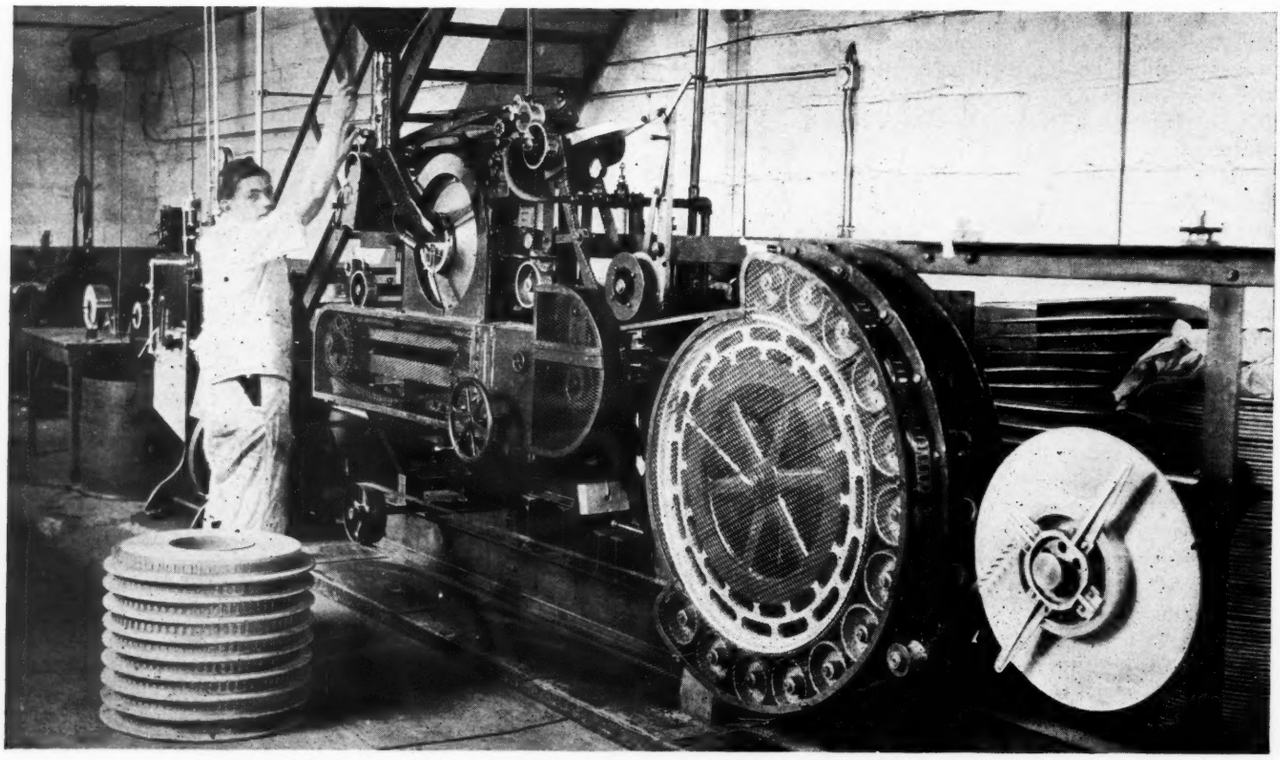
The proportion of the total margarine production which was made from purely vegetable fats was very small a quarter of a century ago. However, with the discovery of the fact that limpid oils could be converted into solid fats by the process of catalytic hydrogenation such a tremendous impetus was given to the use of vegetable fats in margarine that now (for the first time in 1927) more margarine is made from purely vegetable fats than from animal fats in the United States.

Coconut Oil Transmits Flavors

Other important factors which have led to a predominance of vegetable fat margarines are the development of modern oil-refining methods and improved knowledge regarding the handling of cocoanut oil for use in margarine. This oil, when properly refined, has the important characteristic of transmitting flavors, such as those of carefully cultured milks, to a greater degree than do oils and fats containing relatively higher percentages of olein, palmitin, and stearin.

Still another epoch-making innovation in margarine manufacture came even before the advent of vegetable oils, catalytic hydrogenation, and modern oil-refining methods, namely the use of carefully cultured milks, which dates about 1890, from its introduction by Storch and Weigmann. Margarine manufacture today then can be truly said to represent not only the best advancements in the science and art of the vegetable-oil refiner, the dairyman, and the utilization of modern machinery and modern handling methods but also to include rigid scientific control and the marks of a scientifically developed food product.

This powder-wrapping machine turns out celluloid containers of coloring powder for use by the consumer. Two strips of celluloid are used in this machine, which makes depressions in the celluloid strips into which the powder is dropped (the powder container is just in front of the operator). The machine then presses the two strips together, sealing the powder. The strips are then wound on the reel at the right-hand end of the machine.



Simplified Methods of Calculation *for* BELT CONVEYORS

THE SECOND OF TWO ARTICLES

By HARRY F. GEIST

Engineer, Webster Manufacturing Company, Chicago

IN FOOD INDUSTRIES, issue of December, 1928, a study was made of belt capacities and the forces necessary for the movement of bulk materials by means of light conveyor belts. The study was restricted to forces set up in the belt. Tables were presented for selecting suitable belt widths and speeds for the work to be accomplished, and tabulated values were given for mathematically correcting actual conveyor lengths on inclines, and conveyors using anti-friction bearing carriers, to terms of equivalent horizontal lengths. Tables I, II and III in the December article were for reference to Tables IV to VIII inclusive in the present article.

This article deals with driving forces and equipment and is particularly intended to obviate practically all the calculations usually necessary in determining the size of the head shaft, head pulley, effective pull and the horsepower required to operate any definite conveyor belt of a given length and load. It is intended that the engineer may be able to select, almost at a glance, from tables IV to VIII, the equipment required to satisfy his conditions, and to enable him also to compare readily the several ways of performing the same work, for it is recognized that there usually are a number of reasonable answers to a problem when slightly different details are considered.

Before discussing the tables it is advisable to explain briefly the theory involved at the head-shaft; a means for correlating conveyor belt stresses (as previously published) with the capabilities of the driving mechanism, reduction of the resulting correlation to such values as permissible conveyor-lengths for various loads, and the power requirements coincident with these conditions.

HEAD-SHAFT STRESSES

Fig. 5 represents the common form of head-end drive arrangement for a belt conveyor. The head-shaft is subjected to two major stresses in combination. These are torsion and bending. By considering the shaft as driven from only the one projected end, and as exerting a belt pull $= A$, tangentially to the head pulley, at a distance $= R$ from the shaft center, the torsion may be expressed by the equation,

$$\text{Torsional Moment} = AR, \text{ inch-pounds} \qquad (9)$$

assuming that there is no slippage.

To arrive at the bending moment acting upon the head-shaft, it is necessary to consider all the forces,

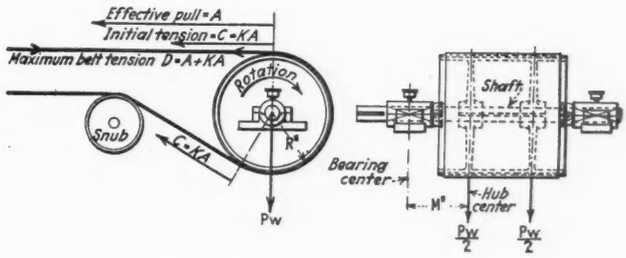


Fig. 5—The head-end driving arrangement of a belt conveyor with diagram of forces.

namely, the effective pull A, the initial tension KA in each strand of the belt, and gravity P_w.

The forces accruing from the belt are

$$F_a = A + 2KA \qquad (10)$$

At right angles to the above we have P_w, which combined with equation 10, gives

$$F = \sqrt{(A + 2KA)^2 + P_w^2} \qquad (11)$$

But the head-shaft is supported by two bearings which share the force F, and since M is the moment arm, the bending moment is

$$\text{Bending Moment} = \frac{M}{2}\sqrt{(A + 2KA)^2 + P_w^2} \qquad (12)$$

If the forces involved are in pounds, and the dimensions are inches, the bending moment is expressed in inch-pounds.

Various formulas, partly empirical and partly theoretical, are given by authorities for combining torsion and bending moments, but in the correlation of values represented by Tables IV to VIII inclusive the writer has resorted to graphic methods. The method employed is illustrated by Fig. 6 and is presented because it explains the derivation of the tables.

Fig. 6 represents the usual form of shafting chart with bending moments as ordinates and torsional moments as abscissas, taken from standard handbooks on the subject.

To the same co-ordinates is plotted the *full load line* of a belt, which in this case is a 36-in. 4-ply 32-oz. belt and is normally good for a maximum working strength of 3,888 lb. The *full load line* of the belt is

constructed by plotting various moments computed from equations 9 and 12 for the several values of $K = 0$, 0.1, 0.4, 0.7, 1, etc., up to 10, and connecting the points with a straight line as shown. The diagram considers a pulley, 36-in. diameter x 38-in. face, double-arm type, lagged with rubber belt, and weighing 1,500 lb.

Of the many values of K, the three values 0.1, 0.4, and 0.7 are taken as a working range sufficient for general belt-conveyor purposes. With various other values of the working strength of the belt, D, less than 3,888 lb., the three dotted lines meeting at 0′ are obtained.

Thus we have a system of shaft curves intersected by three belt-load curves representing three different initial tension conditions for the particular size of headpulley here specified. From these we are able to correlate the shafting capabilities in terms of belt-conveyor data, simply by reading the torsion values at the points of intersection, as, for example, X.

The point X indicates the intersection of the belt curve (for $K = 0.4$) with the combined bending and torsion curve of a $3\frac{7}{16}$-in. diameter shaft stressed to 10,000 lb. per square inch. At the point X a torsion of 38,100 inch-pounds is indicated for the shaft and, since the radius arm of the pulley with its lagging is 18.25 in., the permissible effective belt pull A is $\frac{38{,}100}{18.25} = 2{,}085$ lb.

It was pointed out in the December article that 382.5 lb. is the effective pull required for such a horizontal conveyor 100 ft. long equipped with plain bearing carriers, when loaded to $2.2w^2$ with grain weighing 60 lb. per bushel. The $3\frac{7}{16}$-in. shaft therefore is sufficient for $\frac{2{,}085}{382.5} = 545$ ft. of conveyor.

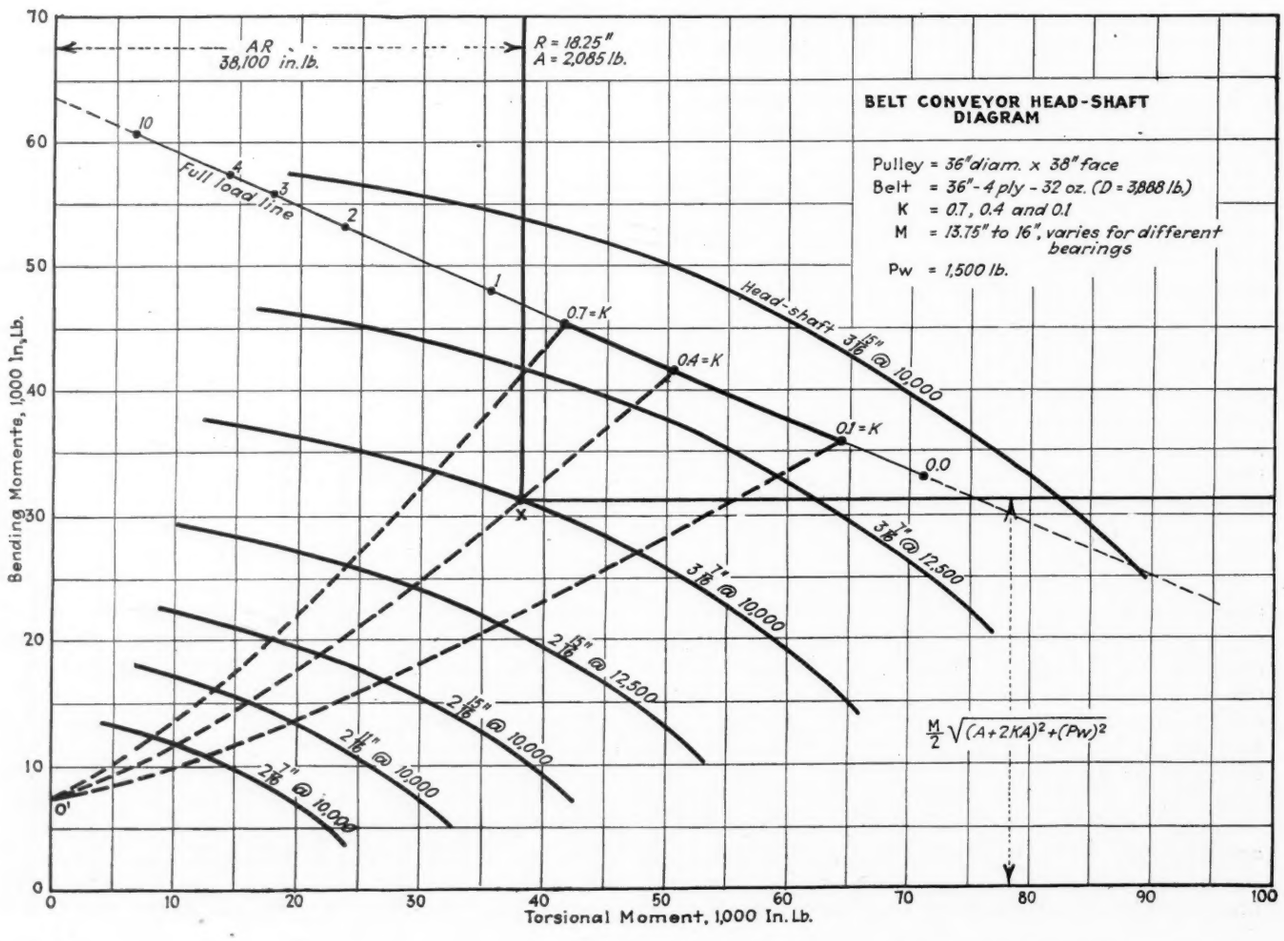
In like manner belt-conveyor lengths may be systematically computed for any of the shafts shown on the chart, for the different values of K, and different loadings, by using the intersections as indices in each case.

The tables IV to VIII inclusive are each based upon diagrams similar to Fig. 6.

Each of the tables, IV to VIII inclusive, has for its caption the general specifications of the conveyor belt for which it is to be used. Naturally belts of other specifications may also apply to the tables if they agree reasonably closely as to width, weight and strength (see footnotes under the tables). The captions show the total thickness of rubber covering for the top and bottom surfaces and, while the division of the rubber covering is optional, it usually would be about $\frac{1}{16}$ in. for the top surface and $\frac{1}{32}$ in. for the underside. The belts included by the tables range from 24 in. to 48 in. wide by increments of 6 in. The normal full working strength, D, of the belt is given in each case with the normal capacities in bushels per hour at 100 ft. per minute, and the maximum speed recommended. The unit horsepower required to operate 100 ft. of conveyor at 100 ft. per minute also is given for purposes that will be discussed later.

Each table is divided horizontally in sections for the

Fig. 6—Belt conveyor head-shaft diagram for graphic correlation of shafting capabilities under a given set of conditions with variable values of K; similar diagrams were worked out for each of the tables IV to VIII.



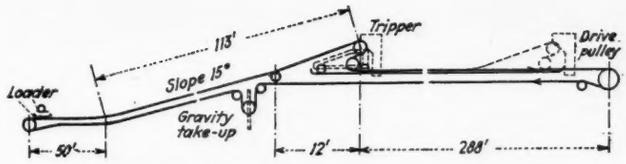


Fig. 7—Typical inclined belt-conveyor system equipped with movable tripper.

various sizes of headshafts which may be used, and these in turn are subdivided for the several feasible pulleys which may be chosen for the shaft. Good practice usually specifies that the head pulley shall have a diameter in inches equal to at least five times the number of plies making up the conveyor belt, thus a 6-ply belt would require a 30-in. head pulley to meet that specification. The rule, however, is not always followed.

The shafts range from some practical minimum size, ample for the head-pulley weight, up to the size required to utilize fully the full working strength, D, of the belt. Shaft stresses of 10,000 and 12,500 lb. per square inch are considered for $2\frac{15}{16}$-in. shafts and larger.

Vertically, the tables are divided into three distinct sections, each based upon values of initial tension as represented by the factor $K = 0.7$, 0.4, and 0.1. In general the different sections show that as the factor K is decreased longer conveyors are permissible for any particular shaft or belt. It is left to the engineer using these tables to choose which value of the factor K suits his problem, however. The middle section represents a fair average and is to be recommended.

Interpolation may be made between either the three divisions of the tables by direct proportion without appreciable error, or between the pulleys listed, or between the shafts. Interpolation for values between the loads represented should be made by graph, or by using the unit-power formula given with each table.

In lightface type, each table gives the horizontal conveyor lengths (based upon the use of plain-bearing carriers) for each shaft and pulley, for three different loading conditions, namely: $1.1_w{}^2$ (flat belts), and $2.2_w{}^2$ and $2.5_w{}^2$ (loadings for troughed belts). The loadings are based upon grains or similar materials weighing 60 lb. per bushel. However, if a material weighing less than 60 lb. per bushel can be loaded onto the belt in a quantity sufficient to represent an equivalent load the tables will apply equally well. See Table I (December Food Industries) for loads per foot of conveyor.

In boldface type the tables give for each group the effective pull, A, in pounds required to move the conveyor belt and its load for the distances and conditions indicated. The horsepower (net at the head-shaft for a belt-speed of 100 ft. per minute) also is given. For maximum conveyor lengths, the distances appear in boldface type under the largest shaft-size in each table.

As previously stated in connection with equation 2 (December Food Industries) it should be understood that the horsepower values are calculated only for the movement of the belt and its load. For speeds other than 100 ft. per minute, multiply the horsepower value by the true speed and divide by 100. To arrive at the size of motor needed, allowance must be made for power losses, principally in speed-reducing or power-transmitting machinery connecting the headshaft with the motor.

All the values given are intended as criteria of the minimum equipment needed for the work to be done and do not take care of the power requirements to drive auxiliary machinery such as feeders, loaders, belt cleaners, or trippers. If such devices derive their power from the conveyor belt, allowance may be made by adding the extra horsepower to that needed for the conveyor proper, and then selecting the headshaft equipment from the tables by virtue of the horsepower values listed.

The tables are further made more complete by giving the value of M used for each shaft. With the value of M, the radius, R, of the head pulley, the initial tension, K, and the effective pull, A, a check may readily be made on shaft stresses, permitting any engineer to make such deviation as his particular problem may dictate.

The general procedure in using the tables is as follows: From Table I (of December Food Industries), knowing the amount of material to be moved and the time in which it is to be moved, one can arrive at the desired rate, the width of belt and the belt speed. The length of haul usually is known. With this information, one may turn to whichever of Tables IV to VIII fits his case and determine the headshaft, head pulley, effective pull and horsepower required. If the distance to convey the material is excessive for the belt, the table shows it at a glance. The effective-pull value gives a quantity upon which to proportion the other equipment needed, such as tail shafts, snubs, take-ups, and the like. These and other applications for the tables become apparent with their use.

The tables apply directly to horizontal conveyors employing the commonly known plain grease-bearing type of belt carrier rolls. If the problem involves the movement of materials on upgrade slopes, or if it is desired to use anti-friction carrier rolls, Table III (of December Food Industries) should be consulted for the mathematical equivalents needed to fit the problem to Tables IV to VIII inclusive. Discretion, however, should be used in correcting for anti-friction type belt carriers—i.e., one should be reasonably sure that the type or make to be used has approximately one-third less friction than plain grease-type carriers before taking full advantage of Table III.

In Table III, column Y represents the base value equivalent of Tables IV to VIII inclusive. The various other columns indicated by Z represent problem conditions of slope and carrier friction that are to be included, and $\frac{Y}{Z}$ is a ratio that corrects the actual conveyor lengths to equivalent lengths applicable directly to the above tables. That is

$$\text{Equiv. Lengths} = \frac{Y}{Z} \times \text{Actual Lengths}$$

The Tables I, III, IV to VIII inclusive, therefore, cover the light-belt conveyor field as fully and completely as is ordinarily likely to be needed.

Fig. 7 illustrates a typical belt-conveyor system with a tripper for distributing grain to a number of storage bins. Assume that the conveyor is to handle 16,000 bushels of wheat per hour and merits the use of a belt 36 in. wide to be run at a speed of 700 ft. per minute, which are figures obtained from Table I. The loading is $2.2_w{}^2$. Assume also that the tripper is of the two-pulley, reversible, belt-operated type having a gross weight of 6,500 lb. and is geared to run at a speed of 100 ft. per minute. The tripper will be moved only when changing the belt discharge point from one bin to another, and then only with the belt running empty.

The course of the belt conveyor is as shown by the figure: 50 horizontal for loading purposes, 113 ft. at 15 deg. upgrade (including the amount needed for ele-

Table IV—Twenty-four Inch, 4-Ply, 32-Oz., 3/32-In. Rubber-Covered Belt

Maximum Horizontal Lengths, Feet

(Plain Bearing Carrier Rolls)

	Head Shaft	1 15/16 In.		2 3/16 In.		2 7/16 In.			2 11/16 In.			2 15/16 In.			3 7/16 In.	
K	R. C. Pulley M, In.	20/26 10.5	24/26	20/26 10.5	24/26	20/26 10.75	24/26	30/26	20/26 10.75	24/26	30/26	20/26 12.0	24/26	30/26	20/26 to 30/26 12.0	
.7	1.1 w²	268	248	398	378	529	507	462	711	685	645	872	839	796	927	
	2.2 w²	197	183	293	278	389	373	340	523	504	475	642	617	586	682	
	2.5 w²	184	171	274	260	364	348	318	488	470	443	598	576	547	636	
	Eff. Pull, Lb.	**440**	**408**	**655**	**621**	**870**	**832**	**760**	**1170**	**1127**	**1062**	**1435**	**1380**	**1310**	**1525**	
	H. P.	**1.34**	**1.24**	**1.99**	**1.89**	**2.64**	**2.53**	**2.31**	**3.54**	**3.41**	**3.22**	**4.35**	**4.18**	**3.97**	**4.62**	
.4	1.1 w²	333	298	491	452	658	615	563	890	845	773	1009	1042	965	1127	
	2.2 w²	245	219	360	333	483	453	413	655	622	570	803	767	710	830	Max.
	2.5 w²	229	205	337	311	452	422	387	611	580	531	750	715	662	773	for
	Eff. Pull, Lb.	**547**	**490**	**806**	**743**	**1082**	**1012**	**925**	**1465**	**1390**	**1272**	**1795**	**1715**	**1586**	**1852**	Belt
	H. P.	**1.66**	**1.49**	**2.45**	**2.26**	**3.28**	**3.06**	**2.81**	**4.43**	**4.21**	**3.85**	**5.43**	**5.20**	**4.8**	**5.62**	
.1	1.1 w²	428	383	638	576	866	790	692	1180	1072	948	1435	1330	1200	1435	
	2.2 w²	315	282	470	423	638	582	510	868	790	698	1055	980	882	1055	
	2.5 w²	294	263	438	395	595	542	476	810	737	651	985	915	915	985	
	Eff. Pull, Lb.	**703**	**630**	**1050**	**946**	**1425**	**1300**	**1140**	**1940**	**1765**	**1560**	**2360**	**2190**	**1970**	**2360**	
	H. P.	**2.14**	**1.91**	**3.18**	**2.87**	**4.32**	**3.94**	**3.45**	**5.87**	**5.34**	**4.72**	**7.15**	**6.63**	**5.97**	**7.15**	

D = 2592 lb.
2.2 w² = 1000 bu./hr. @ 100 ft./min.
2.5 w² = 1150 bu./hr. @ 100 ft./min.
Max. speed = 600 ft./min.

All Shafts at 10,000 lb./sq.in. Fiber Stress

H. P. @ 100 ft./min. Unit Power (100 ft. @ 100 ft./min.) = $.319 + .0358 \frac{Bu}{S}$

(For 24-in., 4-ply, 28-oz. belts use the same values up to 90 per cent of maximum values.)

Table V—Thirty-Inch, 4-Ply, 32-Oz., 3/32-In. Rubber-Covered Belt

Maximum Horizontal Lengths, Feet

(Plain Bearing Carrier Rolls)

	Head Shaft	2 3/16 In. @ 10,000 Lb./Sq.In.		2 7/16 In. @ 10,000 Lb./Sq.In.		2 11/16 In. @ 10,000 Lb./Sq.In.			2 15/16 In. @ 10,000 Lb./Sq.In.			2 15/16 In. @ 12,500 Lb./Sq.In.				3 7/16 In. @ 10,000 Lb./Sq.In.		3 7/16 In. @ 12,500 Lb./Sq.In. 3 15/16 @ 10,000	
K	R. C. Pulley	20/32	24/32	20/32	24/32	20/32	24/32	30/32	20/32	24/32	30/32	20/32	24/32	30/32	36/32	20/32	36/32	36/32	
	M, In.	12.0		12.25		12.25			13.5			13.5				14.0		14.0	
.7	1.1 w²	264	250	359	345	394	470	432	620	595	560	780	756	719	682	895	876	895	
	2.2 w²	186	176	253	244	348	331	305	437	420	394	550	533	507	481	631	618	631	
	2.5 w²	173	163	235	226	323	307	283	406	389	366	511	495	471	446	586	573	586	
	Eff. Pull, Lb.	**562**	**531**	**762**	**735**	**1050**	**1000**	**918**	**1320**	**1265**	**1190**	**1660**	**1610**	**1530**	**1430**	**1905**	**1865**	**1905**	
	H. P.	**1.71**	**1.61**	**2.31**	**2.23**	**3.18**	**3.03**	**2.79**	**4.0**	**3.83**	**3.6**	**5.03**	**4.87**	**4.63**	**4.39**	**5.77**	**5.65**	**5.77**	
.4	1.1 w²	326	302	455	422	620	585	523	780	737	679	896	958	885	825	1085	1612	1085	
	2.2 w²	230	214	321	298	437	413	370	550	520	480	697	677	625	582	766	750	766	Maximum
	2.5 w²	213	199	298	277	406	383	342	561	483	444	646	628	580	540	710	695	710	For
	Eff. Pull, Lb.	**693**	**646**	**967**	**898**	**1320**	**1245**	**1115**	**1660**	**1570**	**1445**	**2100**	**2040**	**1885**	**1755**	**2310**	**2260**	**2310**	Belt
	H. P.	**2.1**	**1.96**	**2.93**	**2.73**	**4.0**	**3.77**	**3.38**	**5.03**	**4.76**	**4.38**	**6.36**	**6.18**	**5.72**	**5.32**	**7.0**	**6.85**	**7.0**	
.1	1.1 w²	430	388	600	547	817	752	655	1040	963	855	1330	1250	1130	1025	1380	1305	1380	
	2.2 w²	303	274	424	386	577	530	462	732	680	603	938	882	796	723	975	920	975	
	2.5 w²	281	254	394	358	535	492	429	680	630	560	870	818	738	670	905	853	905	
	Eff. Pull, lb.	**913**	**825**	**1280**	**1165**	**1740**	**1600**	**1395**	**2210**	**2050**	**1820**	**2830**	**2660**	**2400**	**2180**	**2940**	**2775**	**2940**	
	H. P.	**2.77**	**2.50**	**3.88**	**3.53**	**4.27**	**4.85**	**4.32**	**6.7**	**6.2**	**5.51**	**8.6**	**8.05**	**7.27**	**6.60**	**8.91**	**8.4**	**8.91**	

D = 3240 lb.
2.2 w² = 1600 bu./hr. @ 100 ft./min.
2.5 w² = 1800 bu./hr. @ 100 ft./min.
Max. speed = 650 ft./min.

H. P. @ 100 ft./min. Unit Power (100 ft. @ 100 ft./min.) = $.375 + .0337 \frac{Bu}{S}$

(For 30-in., 4-ply, 28-oz. belts use the same values up to 90 per cent of maximum values.)

Table VI—Thirty-six Inch, 5-Ply, 32-Oz., 3/32-In. Rubber-Covered Belt

Maximum Horizontal Lengths, Feet

(Plain Bearing Carrier Rolls)

	Head Shaft	2 15/16 In. @ 10,000 Lb./Sq.In.			2 15/16 In. @ 12,500 Lb./Sq.In.			3 7/16 In. @ 10,000 Lb./Sq.In.			3 7/16 In. @ 12,500 Lb./Sq.In.			3 13/16 In. @ 10,000 Lb./Sq.In.				3 15/16 In. @ 12,500 Lb./Sq.In. 4 7/16 In. @ 10,000 Lb./Sq.In.	
K	R. C. Pulley	24/30	30/38	36/38	24/30	30/38	36/38	24/38	30/38	36/38	24/38	30/38	36/38	24/38	30/38	36/38	40/38	24/38 to 40/38	
	M, In.	15.0			15.0			15.5			15.5			16.0				16.5	
.7	1.1 w²	397	360	326	522	486	456	662	631	598	813	781	745	980	940	905	866	1015	
	2.2 w²	277	251	227	364	339	318	462	441	417	567	545	520	684	657	632	605	708	
	2.5 w²	256	232	210	337	314	294	427	408	386	525	505	481	633	607	585	560	655	
	Eff. Pull, Lb.	**1120**	**1015**	**918**	**1470**	**1370**	**1285**	**1865**	**1780**	**1685**	**2290**	**2200**	**2100**	**2760**	**2650**	**2550**	**2440**	**2860**	
	H. P.	**3.4**	**3.08**	**2.78**	**4.45**	**4.15**	**3.9**	**5.65**	**5.4**	**5.1**	**6.95**	**6.67**	**6.35**	**8.35**	**8.02**	**7.72**	**7.38**	**8.67**	
.4	1.1 w²	500	448	403	655	596	548	832	781	740	1030	966	916	1230	1170	1097	1040	1230	
	2.2 w²	349	312	282	457	416	383	582	545	517	718	675	639	860	818	766	726	860	
	2.5 w²	323	289	262	423	385	354	537	505	478	665	625	591	795	756	710	670	795	Maximum
	Eff. Pull, Lb.	**1410**	**1262**	**1140**	**1845**	**1680**	**1545**	**2345**	**2200**	**2085**	**2900**	**2725**	**2580**	**3470**	**3300**	**3095**	**2930**	**3470**	for
	H. P.	**4.27**	**3.82**	**3.46**	**5.6**	**5.08**	**4.68**	**7.1**	**6.67**	**6.32**	**8.78**	**8.25**	**7.8**	**10.5**	**10.0**	**9.35**	**8.87**	**10.5**	Belt
.1	1.1 w²	672	595	512	878	792	700	1130	1025	930	1385	1264	1153	1570	1500	1368	1268	1570	
	2.2 w²	470	415	357	613	552	490	790	716	650	967	882	805	1095	1050	955	885	1095	
	2.5 w²	434	384	332	567	510	452	708	662	600	895	816	745	1015	970	882	818	1015	
	Eff. Pull, Lb.	**1895**	**1675**	**1445**	**2475**	**2230**	**1975**	**3185**	**2890**	**2620**	**3900**	**3560**	**3250**	**4420**	**4230**	**3850**	**3570**	**4420**	
	H. P.	**5.75**	**5.07**	**4.38**	**7.5**	**6.75**	**5.98**	**9.65**	**8.75**	**7.95**	**11.8**	**10.8**	**9.85**	**13.4**	**12.8**	**11.7**	**10.85**	**13.4**	

D = 4860 lb.
2.2 w² = 2300 lb./hr. @ 100 ft./min.
2.5 w² = 2600 lb./hr. @ 100 ft./min.
Max. speed = 700 ft./min.

H. P. @ 100 ft./min. Unit Power = $.488 + .0318 \frac{Bu}{S}$

(For 36-in., 4-ply, 32-oz. belts use the same values up to 85 per cent of maximum values.)

Table VII—Forty-Two Inch, 5-Ply, 32-Oz., 3/32-In. Rubber-Covered Belt

Maximum Horizontal Lengths, Feet

(Plain Bearing Carrier Rolls)

	Head Shaft	2 15/16 In. @ 10,000 Lb./Sq.In.		2 15/16 In. @ 12,500 Lb./Sq.In.		3 7/16 In. @ 10,000 Lb./Sq.In			3 7/16 In. @ 12,500 Lb./Sq.In			3 15/16 In. @ 10,000 Lb./Sq.In.			3 15/16 In. @ 12,500 Lb./Sq.In.				4 7/16 In. @ 10,000 Lb./Sq.In.	
K	R. C. Pulley	24/44	30/44	24/44	30/44	24/44	30/44	36/44	24/44	30/44	36/44	24/44	30/44	36/44	24/44	30/44	36/44	40/44	24/44 to 40/44	
	M, In.	16.5		16.5		17.0			17.0			17.5			17.5				18.0	
.7	1.1 w^2	294	275	403	377	526	495	458	646	613	602	778	745	715	958	924	890	853	998	
	2.2 w^2	200	188	276	258	360	338	314	441	420	410	532	510	489	655	632	607	582	685	
	2.5 w^2	185	174	255	238	332	313	290	408	387	380	492	470	452	605	583	561	538	630	
	Eff. Pull, Lb.	**980**	**920**	**1350**	**1260**	**1760**	**1655**	**1536**	**2160**	**2050**	**2010**	**2600**	**2490**	**2390**	**3200**	**3085**	**2970**	**2850**	**3335**	
	H. P.	**2.97**	**2.79**	**4.08**	**3.82**	**5.33**	**5.02**	**4.65**	**6.55**	**6.21**	**6.10**	**7.88**	**7.55**	**7.25**	**9.70**	**9.35**	**9.00**	**8.64**	**10.12**	
.4	1.1 w^2	371	327	503	461	652	613	562	812	766	718	982	935	876	1212	1155	1085	1036	1212	
	2.2 w^2	253	224	344	315	446	419	384	555	523	491	672	638	598	829	790	742	707	829	Maximum for Belt
	2.5 w^2	234	207	317	291	412	387	355	512	483	453	620	590	552	765	730	686	654	765	
	Eff. Pull, Lb.	**1240**	**1095**	**1680**	**1540**	**2180**	**2050**	**1880**	**2710**	**2560**	**2400**	**3280**	**3120**	**2925**	**4050**	**3860**	**3630**	**3460**	**4050**	
	H. P.	**3.76**	**3.32**	**5.09**	**4.67**	**6.61**	**6.21**	**5.70**	**8.20**	**7.75**	**7.27**	**9.94**	**9.45**	**8.87**	**12.28**	**11.70**	**11.00**	**10.50**	**12.28**	
.1	1.1 w^2	497	442	685	618	885	808	725	1115	1012	920	1330	1220	1110	1545	1510	1380	1290	1545	
	2.2 w^2	339	302	469	423	605	552	496	760	691	628	908	833	757	1055	1030	943	881	1055	
	2.5 w^2	314	279	433	390	560	510	457	703	638	580	838	768	698	973	952	870	813	973	
	Eff. Pull, Lb.	**1660**	**1475**	**2290**	**2065**	**2960**	**2700**	**2425**	**3720**	**3380**	**3070**	**4430**	**4070**	**3700**	**5160**	**5040**	**4610**	**4310**	**5160**	
	H. P.	**5.03**	**4.47**	**6.94**	**6.25**	**8.97**	**8.18**	**7.35**	**11.28**	**10.25**	**9.30**	**13.43**	**12.32**	**11.21**	**15.65**	**15.30**	**14.00**	**13.10**	**15.65**	

D = 5670 lb.
2.2 w^2 = 3100 bu./hr. @ 100 ft./min.
2.5 w^2 = 3500 bu./hr. @ 100 ft./min.
Max. speed = 750 ft./min.

H. P. @ 100 ft./min. Unit Power (100 ft. @ 100 ft./min.) = $.543 + .0303 \frac{Bu}{S}$

(For 42-in. 4-ply, 32-oz. belts use the same values up to 85 per cent of maximum values.)

vating over the tripper pulley) and 300 ft. horizontal over the bins. Assume also that the belt carrier rolls are anti-friction type. This gives a problem covering a number of typical conditions.

Referring to Table III (in December FOOD INDUSTRIES), neglecting the tripper temporarily, we can arrive at an equivalent length for the whole conveyor which will be applicable to Table VI. For the horizontal sections, which total 350 ft., we have $Y \div Z = 100 \div 150 = 0.667$, giving an equivalent length of $350 \times 0.667 = 233$ ft. For the sloping section we have $Y \div Z = 100 \div 45 = 2.22$, giving an equivalent length of $113 \times 2.22 = 251$ ft. The total equivalent length is therefore 233 ft. + 251 ft. = 484 ft., which compares with 463 ft. actual length.

If plain-bearing carriers were specified instead of anti-friction type the equivalent length of the system would be 350 ft. + $113 \times 100 \div 39.2 = 638$ ft. compared with 463 ft. actual, showing the advantage gained by the use of anti-friction carriers.

From Table VI we see that for $K = 0.4$ the 36-in. 4-ply and the 36-in. 5-ply are respectively good for maximum lengths of about 725 and 860 ft., so that either of the belts may be selected. The ratios of working stress to normal full working strengths of the belts are, from the relation of lengths, 0.663 and 0.563 respectively.

Assuming that the 5-ply belt is chosen (from the $K = 0.4$ section) of Table VI we arrive at the following information in selecting for 484 ft. with $2.2w^2$ loading:

A $3\frac{7}{16}$-in. diameter headshaft @ 10,000 lb. per square inch with a 36-in. diameter head pulley is sufficient for 517 ft.

The effective pull in the belt is

$$\frac{484}{517} \times 2{,}085 = 1{,}950 \text{ lb.}$$

The net horsepower required at the headshaft is

$$\frac{484}{517} \times 6.32 \times \frac{700}{100} = 41.5 \text{ hp.}$$

The minimum motor required, therefore, is 50 hp.

The power required to move the tripper is equal to that necessary to overcome friction in the tripper itself plus the power needed to run the empty belt, for which we will use the true conveyor length corrected for anti-friction carriers, but not corrected for gravity since the strand going upgrade is neutralized by the return strand down. The equivalent empty length therefore is $463 \times 0.667 = 310$ ft. and requires a power of $\frac{310}{517} \times \frac{6.32}{2} \times \frac{700}{100} = 13.3$ hp., net at the headshaft, assuming that the power required for the empty belt is one-half of that required for a loaded belt.

The net power required to move the tripper at a speed of 100 ft. per minute is

$$\text{Tripper Power} = \frac{6{,}500 \times 0.15 \times 100}{33{,}000} = 3 \text{ hp.,}$$

based upon a resultant friction of 0.15 for the tripper.

The total net power involved at the headshaft when the tripper is moved is therefore 16.3 hp., and may be neglected when compared with the 50-hp. motor specified.

The above example shows briefly the analysis which may be made by the use of the tables. For putting such a circuitous system into practice it would be good judgment, however, to exceed the minimum determinations made from the tables by 10 to 20 per cent.

HANDLING OTHER MATERIALS

As previously stated, the tables apply directly to belt conveyors for grain (at 60 lb. per bushel). Belt conveyors, however, may be used to handle almost any material that does not adhere to, or do damage to, the belt to such an extent as to make it economically impractical. For lumpy, heavy and sharp materials which are likely to bruise or cut the belt plies, heavy-ply belts with thick rubber covers are recommended. For hot materials belts with an asbestos layer protecting the fabric on the carrying side are used for temperatures up to 500 to 600 deg. F. Belts for lower temperatures are made with slow vulcanizing rubber between the plies and with other impregnating compounds. Thus the belt conveyor has a very wide field or application.

The tables of data are intended to cover light belts having specifications as designated in the captions, or for belts closely equivalent in width, weight and strength.

The following is a list of loose, bulk materials with their average weights in pounds per bushel, which may be handled by light belts:

Beans	60	Oats	32
Barley	48	Peaches (dried)	36
Buckwheat	47	Prunes (dried)	30
Castor Beans	50	Figs (dried)	30
Coffee (green)	50	Apples (dried)	24
Coffee (roasted)	28	Peas	60
Corn (shelled)	56	Rice (rough)	45
Cork (ground)	20	Rye	56
Cotton Seed	32	Wheat	60
Clover Seed	60	Salt (dry)	65-80
Flax Seed	56	Sugar	125
Hemp Seed	44	Starch	118
Nuts (average)	50	Saw Dust	16-20

For materials lighter than 60 lb. per bushel there is seldom sufficient advantage to be gained by correcting for the difference in specific weights, except perhaps in determining maximum belt speed and arriving at the size of motor required. However, for materials heavier than 60 lb. per bushel, correction should be made, particularly in the case of long belts.

The means for making such corrections, either for material lighter or heavier than 60 lb. per bushed, is taken care of by means of a unit-power-value equation for each table. For Table VI, for example, the unit-power equation for a 36-in. 5-ply 32-oz. $\frac{3}{32}$-in. rubber-covered belt conveyor, 100 ft. long, with a belt speed of 100 ft. per minute is

$$\text{Unit-Power} = 0.488 + 0.0318\,\frac{Bu}{S}\ \text{horsepower},$$

in which 0.488 is the horsepower required to operate the empty belt, 0.0318 is the horsepower to move a load of 1 lb. of material for each lineal foot of belt (or 100 lb.) and Bu is the number of bushels (at 60 lb. each) and S is the belt speed, as previously explained, from which $\frac{Bu}{S}$ is the weight of material carried per foot of belt, as previously explained.

If, for example, rice at 45 lb. per bushed is handled, the unit power is

$$\text{Unit Power} = 0.488 + 0.0318\,\frac{Bu}{S} \times \frac{45}{60}\ \text{horsepower}.$$

If 2,300 bushels of rice is handled for each 100 ft. per minute of belt speed, the power required for such a conveyor, 400 ft. long, will obviously be

$$4 \times \left(0.488 + 0.0318 \times \frac{2{,}300}{100} \times \frac{45}{60}\right) = 4.15\ \text{hp}.$$

This value, instead of the conveyor length, may be referred to Table VI for determining the headshaft and head pulley.

As stated previously, this article and its tables are intended only to cover problems involving the use of the lighter grades of conveyor belt. For the heavier materials and especially materials with large lumps, the reader is referred to tables similar to the above published in *Chemical & Metallurgical Engineering,* issues of November and December, 1927. While the latter tables apply especially to materials from pit, mine and quarry they may also be used for such large produce as sugar beets, for coconuts or other similar supplies required by the food industries.

Table VIII—Forty-Eight Inch, 6-Ply, 32-Oz., 3/32-In. Rubber-Covered Belt

Maximum Horizontal Lengths, Feet

(Plain Bearing Carrier Rolls)

	Head Shaft	3 7/16 In. @ 10,000 Lb./Sq.In.		3 7/16 In. @ 12,500 Lb./Sq.In.		3 15/16 In. @ 10,000 Lb./Sq.In.			3 15/16 In. @ 12,500 Lb./Sq.In.				4 7/16 In. @ 10,000 Lb./Sq.In.				
K	R. C. Pulley	30/51	36/51	30/31	36/51	30/51	36/51	40/51	30/51	36/51	40/51	44/51	30/51	36/51	40/51	44/51	48/51
	M, In.	18.75		18.75		19.25			19.25				19.75				
.7	1.1 w²	348	320	455	433	560	521	492	700	655	632	610	800	760	735	715	683
	2.2 w²	239	219	312	285	384	357	338	480	448	433	418	547	520	505	491	468
	2.5 w²	220	202	287	263	353	329	311	442	413	398	385	503	480	465	452	431
	Eff. Pull, Lb.	**1430**	**1316**	**1870**	**1710**	**2300**	**2140**	**2035**	**2880**	**2690**	**2595**	**2510**	**3280**	**3120**	**3025**	**2940**	**2810**
	H. P.	**4.33**	**3.99**	**5.67**	**5.18**	**6.97**	**6.48**	**6.13**	**8.73**	**8.15**	**7.88**	**7.60**	**9.95**	**9.47**	**9.20**	**8.92**	**8.53**
.4	1.1 w²	448	406	570	527	695	648	602	865	816	777	735	998	972	911	870	845
	2.2 w²	307	277	390	362	475	443	412	592	560	532	503	684	649	623	595	579
	2.5 w²	283	256	360	333	438	408	380	545	515	490	464	630	597	575	548	533
	Eff. Pull, Lb.	**1840**	**1666**	**2340**	**2165**	**2855**	**2660**	**2470**	**3545**	**3350**	**3190**	**3020**	**4100**	**3890**	**3740**	**3570**	**3470**
	H. P.	**5.58**	**5.05**	**7.10**	**6.57**	**8.65**	**8.06**	**7.48**	**10.75**	**10.40**	**9.67**	**9.15**	**12.42**	**11.65**	**11.35**	**10.85**	**10.52**
.1	1.1 w²	580	513	755	682	920	835	765	1155	1055	987	920	1338	1230	1156	1083	1025
	2.2 w²	397	352	517	467	630	555	523	791	724	676	630	915	842	793	743	702
	2.5 w²	366	324	476	430	580	527	482	729	666	622	580	844	775	730	683	647
	Eff. Pull, Lb.	**2380**	**2110**	**3100**	**2800**	**3775**	**3430**	**3140**	**4740**	**4330**	**4050**	**3775**	**5490**	**5050**	**5750**	**4450**	**4210**
	H. P.	**7.22**	**6.40**	**9.40**	**8.50**	**11.45**	**10.40**	**9.52**	**14.40**	**13.16**	**12.30**	**11.45**	**16.65**	**15.30**	**14.40**	**13.50**	**12.75**

	Head Shaft	4 7/16 In. @ 12,500 Lb./Sq.In.					4 15/16 @ 10,000 Lb./Sq.In.					4 15/16 In. @ 12,500 Lb./Sq.In 5 7/16 In. @ 10,000 Lb./Sq.In.	
K	R. C. Pulley	30/51	36/51	40/51	44/51	48/51	30/51	36/51	40/51	44/51	48/51	30/51 to 48/51	
	M, In.	19.75					20.25					20.75	
.7	1.1 w²	940	910	883	860	830	1040	1010	985	965	940	1115	
	2.2 w²	646	622	605	590	569	715	692	676	660	644	762	
	2.5 w²	595	573	558	542	523	659	636	622	608	593	702	
	Eff. Pull, Lb.	**3870**	**4730**	**3630**	**3530**	**3410**	**4280**	**4140**	**4050**	**3960**	**3860**	**4570**	
	H. P.	**11.75**	**11.30**	**11.00**	**10.70**	**10.35**	**13.00**	**12.60**	**12.30**	**12.00**	**11.70**	**13.85**	
4	1.1 w²	1200	1130	1090	1050	1015	1330	1285	1220	1180	1145	1350	Maximum for Belt
	2.2 w²	820	775	750	717	695	913	880	835	810	785	927	
	2.5 w²	756	713	690	660	640	840	810	768	745	722	853	
	Eff. Pull, Lb.	**4920**	**4640**	**4480**	**4300**	**4170**	**5470**	**5270**	**5000**	**4850**	**4700**	**5550**	
	H. P.	**14.90**	**14.10**	**13.60**	**13.10**	**12.70**	**16.60**	**16.00**	**15.20**	**14.70**	**14.25**	**16.80**	
.1	1.1 w²	1590	1460	1390	1305	1235	1720	1650	1563	1485	1405	1720	
	2.2 w²	1090	1000	952	893	845	1180	1130	1070	1015	962	1180	
	2.5 w²	1000	922	875	822	780	1087	1040	986	936	886	1087	
	Eff. Pull, Lb.	**6530**	**6000**	**5700**	**5350**	**5070**	**7070**	**6770**	**6420**	**6090**	**5770**	**7070**	
	H. P.	**19.80**	**18.20**	**17.30**	**16.30**	**15.40**	**21.40**	**20.50**	**19.50**	**18.50**	**17.50**	**21.4**	

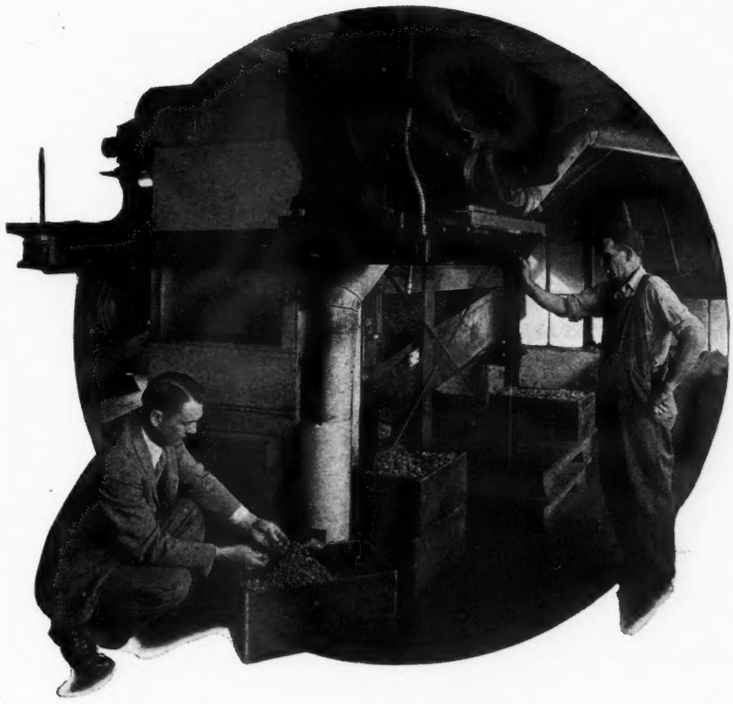
D = 7776 lb.
2.2 w² = 4050 bu./hr. @ 100 ft./min.
2.5 w² = 4600 bu./hr. @ 100 ft./min.
Max. speed = 800 ft./min.

H. P. @ 100 ft./min. Unit power (100 ft. @ 100 ft./min.) = .665 + .0288 $\frac{Bu}{S}$

(For 48-in., 5-ply, 32-oz. belts use the same values up to 87½ per cent of maximum values.)

Reclaiming BLEMISHED WALNUTS *and Utilizing the Byproducts*

By MEL WHARTON
Los Angeles, Calif.



Cleaning and weighing walnut meats. Meats being placed in hopper, after which they are cleaned by air jets and brushes, and weighed on scales at other end. Note screened, inclosed electrical units at upper left.

RECLAMATION and complete utilization of the byproducts of blemished walnuts, made commercially feasible through the application of mechanical methods of processing installed at the central plant of the California Walnut Growers Association at Los Angeles, has added more than $1,000,000 to the value of the annual crop of the state, as well as having proved instrumental in extending the market of the California-grown walnut among American consumers. The American walnut industry is centered in California, where 95 per cent of the domestic crop is grown. Eighty-five per cent of the state's walnut production is grown by the 5,093 members of the association. The average crop amounts to about 76,000,000 lb. and is valued at $15,000,000 yearly.

In addition to the central "cracking" plant, there are 37 local packing houses maintained by the association throughout the walnut-growing area, which is concentrated in southern California. At these "locals" the walnuts are first graded and packed, the blemished nuts being sent by motor truck to the central plant for processing and utilization. All walnuts are sold through the association, which attends to all matters concerning walnuts, including financing, storage, packing, advertising, selling and distribution.

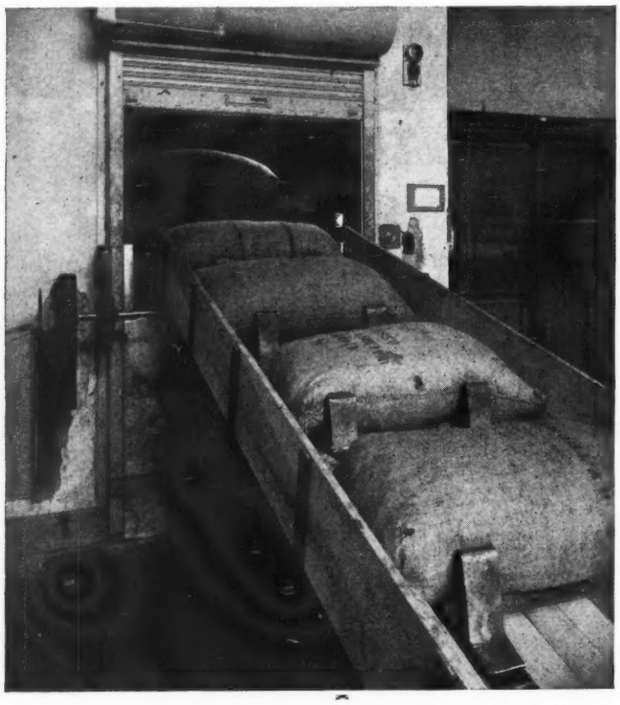
One vexing problem of the industry has been the 10 per cent "imperfect" nuts harvested each season. The term did not imply unwholesomeness, or even a lower grade of meats than in the so-called "perfect" walnuts, yet the imperfects were classed as culls, and as such were worth only 75c. per 100 lb. Imperfect, cracked or stained shells, before complete mechanization of the plant to reclaim and fully utilize all byproducts economically, speedily and sanitarily, at once relegated all kernels irrespective of their condition—and many were high grade—to commercial insignificance.

The association shelling or cracking plant, a 7-story reinforced concrete building located at 1745 East Seventh Street, Los Angeles, contains 133,000 sq.ft. of floor space, and is equipped with modern, electrically operated time- and labor-saving machinery. By means of ample conveying systems, the walnuts in process are continually in motion from time received until packed and ready for distribution. The equipment takes the walnuts through the various cleaning, sorting, vacuum canning and packing processes, and saves every iota, including the shells; and so raises the grade of a large percentage of the imperfect or blemished walnuts that more than $1,000,000 has been added to the value of the California walnut industry.

The blemished-shell walnuts begin their mechanical journey as soon as received at the central cracking plant from trucks from the various locals scattered through the California walnut belt. The 100-lb. sacks of walnuts are placed on an endless-chain drag elevator which moves them at the rate of 30 bags per minute onto a vertical elevator for distribution at any floor desired. The vertical conveyer also is of endless-chain type, capable of carrying 1½ tons per minute over its 86-ft. length.

Spring steel prongs, three of which are needed to carry

each sack, are placed at 4½-ft. intervals the vertical length of the chain. These prongs are shaped concave to fit the form of the filled sacks of walnuts. They are designed so as not to tear the burlap bags, and the space interval is so synchronized with the receiving take-off that there never is a drop of more than 6 in. Walnuts bruise easily, and this fact was taken into consideration to preserve the quality of the nuts. Each spring steel prong is 24 in. long and these are set horizontally 20 in. apart. These two conveyors effect a direct saving of 45



The first operation at central shelling plant of California Walnut Growers Association—showing endless-chain drag elevator passing sacks of walnuts onto vertical endless chain elevator at rate of 1½ tons per minute

per cent in man-hours, according to studies made by the plant's production department.

Actual processing begins on the fourth and fifth floors. The sixth floor is used for storage, while the top, or seventh, contains a double-roller bag printing press for stamping trade brands into the burlap walnut sacks. These sacks are used for packing walnuts. The capacity of the press is 1,600 bags an hour fed through an electric belt conveyor. A hydraulic press exerting 200 lb. to the square inch pressure packages the printed bags for distribution after they have been strapped with hoop wire. A spiral gravity conveyor operates from the seventh to fourth floors of the plant.

The walnuts are emptied into an especially built, cylindrical steel grader having 30,000 openings of various sizes. This was especially designed for its purpose and is located on the fourth floor of the plant. This grader has three different sizes of openings, all having different shapes. These sizes and shapes were determined only after actual experiments continuing over a period of several years. The machine is the only one of its kind ever built. It is 16 ft. long, with diameter of 3½ ft.

Section 1 of the grader contains oblong openings 1 in. long by $\frac{3}{16}$ in. wide. Through these holes nothing but dirt and small twigs will fall into a hopper to be sacked and carried away. Section 2 contains openings 1x$\frac{5}{8}$ in., also oblong. Through this screen the "splits" fall into sacks to be utilized. Splits are walnuts which have cracked open but nevertheless contain good, wholesome kernals. The third and last section contains perfectly round openings with diameters of $\frac{15}{16}$ in. These holes will reject the "pee-wees," or little walnuts too small for regular processing, permitting the walnuts which pass the size tests to flow through onto a drag elevator which conveys them to the fifth floor. A spiral guide of metal running inside the grading cylinder keeps the walnuts always in forward motion. Stiff brushes are attached to the outside of the cylinder, and these push back into the grader all those nuts which tend to stick and clog the machine, permitting them to be regraded. This grader is geared to make 30 revolutions each minute and is powered by a 5-hp. motor.

From the grader the walnuts going through pass onto a drag elevator inclined at 45 deg. and having a woven-cotton friction-drive belt to which is riveted every 14 in. horizontally across the belt a wooden cleat 2 in. square. Two chains spaced 14 in. apart operate this elevator, which has a speed of 80 ft. per minute. The belt is 12 in. wide and the conveyor's capacity is 6,000 lb. an hour.

The conveyor has outlets upon the fifth floor to three auxiliary horizontal conveyors which feed the cracking machine hoppers. These are 9-in. wide cotton belt conveyors running in wooden channels 6 in. high. The capacity of each of these three lines is 2,000 lb. an hour. All conveyor systems in the California Walnut Growers Association cracking plant have been chosen with the paramount idea in mind of preventing bruising. Bruising tends to lower walnut grades by discoloration. It was essential, therefore, that conveyors should run smoothly and with as little disruption and shock as possible. This ideal has been achieved throughout the plant.

At the end of each of the three horizontal conveyors described above is a hopper that feeds the cracking machines which are capable of cracking 2,400 lb. of walnuts each hour. The association has gone to much trouble in designing and perfecting these walnut-cracking machines, upon which they hold exclusive rights. They are the only ones of their nature in use in the walnut industry.

The machine is made of cast iron and rests on timbers 8x12 in. thick fastened to the floor. Each cracking machine consists of a double unit, which in turn consists of twelve tapered jaws secured to one side of a stationary bar, and on the other side by opposing jaws, which move on a parallel bar due to the exertion which is produced by a cam.

The walnuts are fed from the hopper by means of plungers, which work up and down through the walnuts in the hopper. These plungers are concave on the end and are lower on the outside than on the inside, so that when they reach the top of the upstroke the walnuts automatically fall into feeding channels, which in turn drop the walnuts into the cracking jaws. Plungers and cracking jaws are so synchronized that the walnut feeds at the proper time.

An interval of two seconds or 10 deg. on the flywheel is allowed for the walnut to adjust itself in the taper jaw. As soon as this adjustment is completed, the cracking cam rides around and exerts the needed pressure on the nut. After this cracking has occurred an opposing cam causes the jaws to be released and the cracked nut falls upon an inclined board which feeds the sacking apparatus. The machine weighs 3 tons and is so counterbalanced that in spite of the necessary lost motion due to

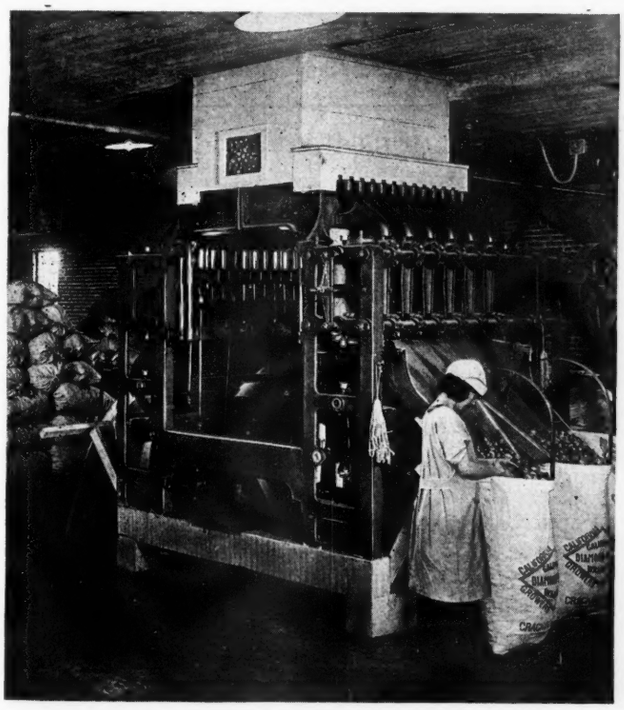
cracking, it is equalized to such a degree that the machine runs very smoothly at all times. These machines are each powered by 5-hp. electric motors. The exertion used in cracking walnuts is on a horizontal plane, reducing the effect there would be on the plant's flooring if on a vertical plane. One person by hand can crack 500 lb. a day. An average day's cracking by machine is 40,000 lb., giving an advantage over hand labor of 80 to 3, only one person being required to attend each machine.

The sacked, cracked walnuts are then stacked on lift-jack platforms and lowered by elevator to the third floor for hand picking. This operation consists of separating the meats from the shells. After picking, the meats are taken to grading tables where, at moving belt conveyors, girls grade the kernels according to color and size. There are six grading conveyors. These latter are 9 ft. long, served by 18-in. woven cotton and linen belts and powered for operation by 1½-hp. motors.

At the feed end of each grader is a hopper capable of holding 150 lb. of walnut meats. The bottoms of the hoppers are fitted with spreader agitators which distribute the kernels evenly the width of the belt, thus shifting this work from the girl graders who stand at the belts and pick out and grade the walnuts. Loss in scarring has been considerably reduced since the belt conveyor, spreading and sorting tables have been installed, largely due to the fact that the mechanization of the process has reduced handling. An average of six girls attends each grading table. Grading is a yet an "eye" process, necessitating a keen apperception of color, and probably is the most purely manual operation in the plant, as well as one upon which depends much of the reputation of the association.

The shells, among which always is a quantity of meats too small to be handled by hand pickers, are conveyed by a metallic spiral conveyor to a unique separating machine. This machine has 18 in. of vacuum, so finely balanced

Mechanical cracking machine. Three of these do the work of 80 operatives and help make possible through economies the utilization of blemished walnuts.



Reclaiming machine operated by vacuum which draws off lighter shells, allowing walnut meats to remain. This machine saves $175 daily to the association.

that it draws off and upward the lighter shells and fibre partitions, permitting the heavier, wholesome pieces to drop into a bin. About 675 lb. of good quality meats with a value of $175 are reclaimed by this apparatus daily, and sold chiefly to bakers and confectioners.

Before packing, all walnuts which have been shelled pass through a cleaning machine employing air jets at 110 lb. pressure, and brushes as cleaning mediums. Dust and fiber partitions are removed, after which the meats pass into a hopper onto scales to be weighed and packed.

The first-quality meats are then canned under vacuum. Automatic Hoepner scales fill six cans at a time at the rate of 60 per minute. The cans move by belt conveyor to the capping mechanism, and are next sealed by a spindle-type vacuum sealing machine made by the American Can Company. By this system of canning, a percentage of wholesome meats which otherwise would not be so utilized is converted into excellent, merchantable food, bringing a splendid market price and filling a real need with the housewife.

Not all walnut meats, because of mold and worms, are fit for human consumption. Such meats are pressed, the oil being used chiefly by the paint industries. By means of a hydraulic screw press which exerts a pressure of 2,200 lb. to the square inch, the oil is recovered. So perfect has been recovery that less than 3 per cent oil remains in the residue cake after pressing. This press will handle 80,000 lb. of walnuts each 8-hour day from which is derived approximately 6,000 lb. of walnut oil. Without further refining, this oil is used by the paint industry in making paints and for this purpose the most is sold. The pressed and reclaimed oil also is employed as a filler in beef and sausage preservatives and, after further refining, as a palatable salad oil.

The pressed cake is extremely hard. It is shipped and

Process of vacuum canning of walnut meats, a system that has reclaimed otherwise almost worthless food into first-class wholesome food and saved a million dollars to the California walnut industry

sold as cattle food but cannot be so utilized until it has undergone a thorough soaking in water, which so softens the cake that cattle can consume it. Another use has recently come into existence for the pressed cake: it has been found an excellent composition filler in the manufacture of radio speaker horns. Its quality of filtering out vibrations is said to be exceeded by few mediums.

The broken walnut shells are made into charcoal. This is accomplished by heat treatment in a cylindrical drum 30 ft. long and 3 ft. 6 in. in diameter which revolves inside another drum, the outer drum being used largely as a heat insulator. A line of gas burners plays upon the inner drum, in which is placed from 10 to 12 tons of shells at a batch. Both drums are of iron, the outer drum being insulated with an asbestos covering. The inner drum is revolved, for four hours, at a temperature of 475 deg. F., the walnut tissues breaking down to form a high-grade charcoal. About 37 per cent of the original load goes off in vapors and gas, the remainder being reclaimed as charcoal which is used chiefly as a filter for fluids. The vinegar industry is one of the largest users of walnut charcoal to clarify its products.

During the rush season at the cracking plant, which extends from October to April 1, about 800 women and girls are employed at the central, or cracking, plant of the California Walnut Growers Association in Los Angeles. Each of these is supplied with cap and apron, the forewomen and checkers wearing white aprons and the others blue aprons and caps to match. These uniforms are made of denim and are changed every other day, sometimes oftener. The cracking plant operates its own laundry for this purpose on the roof of its factory. All appliances here also are electrically operated. The units consist of an electric washer, a drier and two ironers. Approximately 4,000 aprons are washed and ironed weekly.

Every precaution is taken at the association cracking plant to insure sanitation and the health of its employees. Elaborate ventilation systems have been installed to carry away all dust and obnoxious vapors. A complete first-aid room for women, with a trained nurse always in charge, is maintained. Special attention is given to lavatory facilities, cleanliness being stressed as a prerequisite at the plant. Regular medical inspection by the Los Angeles County Health Officers is provided for all employees who handle food products.

Through the economical handling of blemished walnuts, more than $1,000,000 has been added to the annual income of the California industry, and several other hundreds of thousands of dollars added by diversion of by-products into remunerative channels. The complete mechanization of the association's cracking plant has not only vastly speeded production and made the reclamation possible but has created a new product for the American housewife, the vacuum-canned walnut, available all year round irrespective of weather conditions. And the customer has further gained through receiving a more carefully graded, better packed, and thoroughly sanitary food — a food retrieved through mechanical processing, from virtual commercial oblivion.

Officers of the California Walnut Growers Association are C. C. Teague, president; A. J. McFadden, vice-president; W. T. Webber, secretary and sales manager; and Carlyle Thorpe, general manager.

Calculations for Wooden Boxes

An empirical formula has been developed by the testing laboratory of the Wooden Box Bureau by which the approximate proper thickness of the sides, tops and bottoms of wooden boxes, nailed according to the Bureau's schedule, may be computed when the sizes of the containers and weight of their contents are known. This is an important development, for it is now possible to calculate the specifications of a wooden box of known carrying ability.

The formula follows:

$$T = \frac{1}{8}\sqrt{\frac{G}{W}}$$

in which, T = thickness in inches,
G = gross weight of box and contents,
W = width of the part being computed.

When a single reinforcing strap is placed around the box a reduction of 25 per cent in thickness is permissible and when two such straps are employed a reduction of 35 per cent is possible with safety.

A State Studies FLOUR MILLING

Minnesota State Experimental Flour Mill; the addition at the right is the flour warehouse

By R. C. SHERWOOD
Director, Minnesota State Testing Mill

WE HAVE winter wheat and spring wheat. Which is better for milling into flour, and how much better? We have several market grades of wheat. How much inferior is one grade to another, and what price differences should apply? New varieties of wheat appear from time to time. What is their real worth for flour manufacture? Frosted wheat is common in the Northwest. Damp wheat is very common. Weed seeds and other foreign matter are practically universal in commercial wheat. What is the true value of such wheats? What factors are most important in determining milling and baking value? And lastly, who is going to answer these questions and collect scientific data as a basis for determining the relative value of wheat of different grades and types for the benefit of farmer, grain dealer, miller and baker?

In 1919 the Minnesota Legislature decided that the state should undertake a solution of these problems of the wheat industry, and in 1921 the Minnesota State Testing Mill began operation as the only large-scale state-owned experimental flour mill of its kind in the world.

While the Minnesota State Grain Inspection Department had operated a testing laboratory for several years, the milling facilities consisted of a laboratory experimental roller mill capable of handling small samples of wheat weighing a few pounds. Questions can be raised concerning the reliability of tests on such a small scale. Certain it is that the yields of flour obtained do not correspond with the results of the large commercial mill, and the purifying of flour by removal of small particles of the branny covering of the wheat kernel cannot be accomplished as it is in the commercial mill. Therefore, the Minnesota Legislature decided that only a commercial sized testing mill would be adequate for the undertaking.

There is probably no other flour mill just like this one. It is built with commercial machinery throughout, but with special equipment to permit experimental studies. While of commercial design, it was not the intention to engage the state in flour milling on a large scale, but rather to provide adequate facilities for testing wheat on a large scale under conditions approximately the same as those found in the larger commercial mills. In this mill, wheat purchased in car lots in the open market can be tested under controlled conditions to determine the value of different grades and types of wheat to the grain industry and to the miller.

Sufficient flour is manufactured during the course of the milling tests to permit large-scale baking trials. The fine co-operation of the commercial bakeries in the Twin Cities and the assistance of the mill laboratories which have commercial baking machinery have enabled the mill staff to supplement its own laboratory baking tests with commercial bakes using from 50 to 500 lb. of flour. This gives final proof that the flour manufactured from a particular type of wheat is suitable for normal production of bread.

COMPLETE EQUIPMENT OF MACHINERY

A brief description of the mill will help the reader to understand how it is able to solve problems for the wheat producer and the miller. Facilities are provided for handling car lots of wheat in bulk. Wheat taken from cars is first run into a pit, then elevated to a hopper scale for weighing, from which it falls to a cleaning separator designed to remove very coarse and very fine screenings. From this separator the wheat is elevated to storage bins. It is then only partially clean, and must go through a series of cleaning machines before it is ready for grinding into flour.

The cleaning system includes a Carter-Mayhew disk separator, a Wolf washer, a Kennedy wheat heater, and three dry scourers. The disk separator removes wild oats and other seeds, which are diverted to a bin where they can be weighed and subsequently ground for mixing with the feeds. The system of washing and scouring removes a great deal of dirt and makes it possible to

produce much whiter and cleaner flour with lower ash content. In cold weather the wheat drawn from the storage bins must be heated to a temperature of 65 to 70 deg. F. before the addition of water used in conditioning.

Wheat as purchased is not, as a rule, in suitable condition for milling without the addition of water to toughen the bran and soften the endosperm of the kernel. This process of wetting and storing in tanks for several hours to permit penetration of the water is known to flour millers as "tempering." After passing through the cleaning and tempering systems the wheat is stored in a bin above the grinding floor, where it can be drawn out at the desired rate of flow. Fans and dust collectors provided in both the mill proper and the cleaning department render the air in the mill practically free from dust.

The mill has a daily capacity of 150 barrels of flour (196 lb. per barrel). This means that each hour the mill operates, about 30 bushels of wheat is ground, with the production of about six and one-half barrels of flour, and roughly 500 lb. of the various mill feeds. Electrical power is provided throughout. A series of motors varying from 3 to 50 hp. permit operation of separate units of the plant at will.

Classified as Five-Break Mill

Flour mills frequently are classified according to the number of rolls which they contain. This is known to flour millers as a five-break mill. This expression refers to the number of pairs of corrugated rolls which serve to crack or grind the wheat. In addition there are nine pairs of smooth rolls to pulverize the purified middlings, or "chunks," which have been separated from the bran and germ—fourteen pairs of rolls in all.

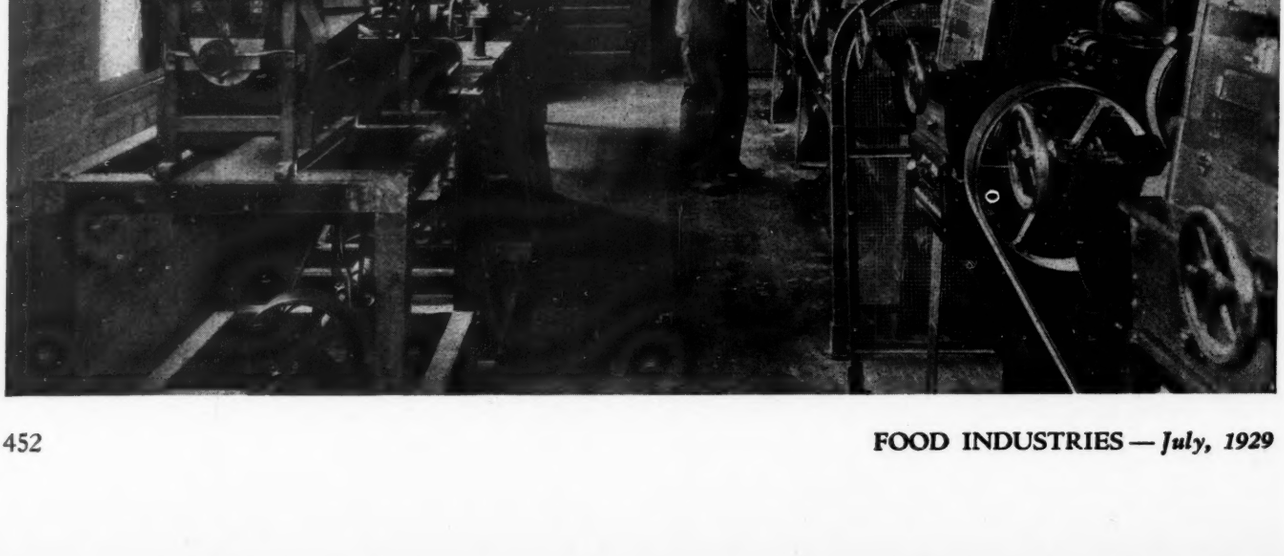
Most readers probably know that milling of wheat into flour is much more complicated than merely grinding wheat and sifting out flour. The present-day process is one of gradual reduction of the particles of the endosperm or inner portion of the wheat kernel. Many repetitions of sifting and sizing the particles are required. Air suction is used to remove small pieces of bran and "beeswing," as the miller calls the light fluffy material removed from the branny covering. An excellent separation finally is made between the inner portions of the wheat berry and its less digestible and more highly colored covering. This elaborate system causes the production of sixteen different flour "streams," as they are called. As these streams differ in their chemical composition, their color and their baking properties, the combination of the streams in different ways provides a means of making many grades of flour.

Four Types of Bleaching Equipment Used

Bleaching of flour commonly is practiced in commercial mills. The effect of bleaching with different agents in varying concentrations must be learned when studying new types and varieties of wheat. For this purpose the State Testing Mill is provided with the four types of bleaching equipment generally in use, namely, the Alsop or nitrogen tetroxid, the Industrial Appliance or Beta-Chlor, the Agene or nitrogen trichloride, and the Novadel or benzoyl peroxid processes.

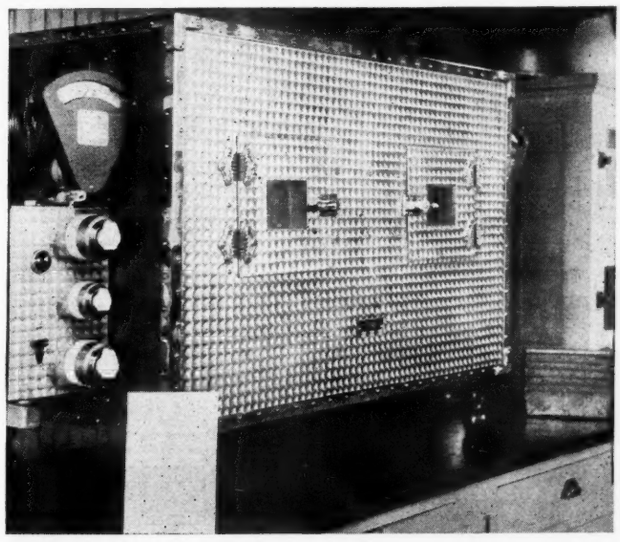
Throughout the mill many special devices have been added to aid in making experimental milling tests. For example, it is possible to determine accurately the weight of screenings removed from the wheat as it is received in the mill, and later as it is finally cleaned for grinding. Automatic scales record the weight of uncleaned wheat drawn for tests; bins are provided for storing wheat in 100-bushel quantities en route to the rolls; a water meter records the quantity of water added during conditioning; automatic scales again record the weight of wheat flowing to the rolls. The products of milling are weighed separately to determine the yields obtained and special bins are installed for storing the flour produced during

The grinding floor; wheat and partially ground stocks flow by gravity to the rolls from the sifters and purifiers on the floors above; at the left is the laboratory flour mill



each of the experimental runs. Samples of the various stocks and flour streams can be drawn for tests during the process of milling.

No experimental flour mill can function properly without a chemical and baking laboratory. The State Mill laboratory is equipped for the examination of both raw materials and finished products. Wheat purchased for



A portion of the laboratory showing the fermentation cabinet and bake oven

milling must be tested for grade, dockage, weight per bushel, moisture content, protein content, and other characteristics.

For testing, and thereby controlling, moisture content of wheat during preparation for milling, for checking the analysis of the mill stocks being ground, and the finished products, both flour and feeds, there is the usual array of balances, moisture ovens, ashing muffle, and protein digestion equipment.

Laboratory for Baking Tests

In addition to such apparatus, there is equipment for laboratory baking tests of flour. A mechanical mixer and an electrically heated and controlled fermentation cabinet provide means for preparing doughs uniformly, and fermenting them under uniform conditions. Baking of bread is done in a two-compartment electrically heated and automatically controlled experimental oven. The State Testing Mill is fortunate, also, in enjoying the co-operation of the University of Minnesota, where special laboratory facilities are available in the division of agricultural biochemistry for study of cereal problems.

What is being done with this experimental flour mill and its laboratory? There are several lines of activity which can be mentioned here, although no attempt will be made to elaborate upon results of experiments, the details of which have been published in a series of bulletins and journal papers.

Study of the relative milling and baking value of different grades of wheat has been a major problem since the mill began operation. The source of material for this study is the wheat market in Minneapolis, where all types of wheat produced in the Northwest, as well as some from other sections, are offered for sale in carload quantities after being inspected and graded by the Minnesota State Grain Inspection Department. The cars of wheat thus purchased are unloaded at the Testing Mill for milling tests which determine the yields of flour and feeds that can be obtained, and chemical and baking tests which show the characteristics of the products of manufacture.

Many different grades and types of wheat are thus studied. Not everyone is aware of the fact that all wheat offered for sale does not yield the same proportion of flour, nor even flour of the same chemical and baking properties. The numerous brands of commercial flours which can be purchased upon the market may differ somewhat in baking quality but they will all make good bread. These uniform, good-baking flours do not indicate the variations in the character of the raw material as it is grown, for they are milled almost invariably from blended wheats, which have been tested and properly proportioned to produce flour suitable for bake-shop use.

Two Criteria of Wheat Value

In selecting wheat for milling purposes two major considerations are uppermost in the mind of the wheat buyer: First, what will be the yield of flour; second, what will be the baking properties of that flour?

Yield of flour has been found to depend upon many factors, but primarily upon plumpness of the wheat, which is normally indicated by the weight per measured bushel, and upon moisture content. Other things being equal, heavier wheat yields more flour than light or shriveled wheat. Wheat weighing 62 lb. per bushel has yielded 78 per cent of straight flour, while wheat weighing 43 lb. yielded only 61 per cent. This is an enormous difference and while it represents extremes, it is indicative of a large difference in market value of the two types of wheat, perhaps as much as 40c. per bushel. Variations in yield of flour usually are much smaller. The following table shows the average yield of four grades of wheat of the 1926 crop:

Grade	Number of Samples	Straight Grade Flour, Per Cent
No. 1	15	71.26
No. 2	21	70.21
No. 3	7	69.60
No. 4	3	69.38

Moisture content of purchased wheat has a direct relation to yield of total products. Results of milling tests in the State Testing Mill show that in this particular mill the weight of the milled product may be expected to equal the weight of the original wheat when the wheat contains 13 per cent moisture. An overrun normally is found when the moisture content is less and a shortage when the original moisture content exceeds that figure. The invisible loss in milling high-moisture wheat, coupled with the hazard in storing such wheat, necessitates a discount in the purchase price. These results are due to the fact that evaporation in the mill compensates for the added water used in conditioning the wheat when the original moisture content approximates 13 per cent.

Flour quality is not as easily measured as flour yield. It is less tangible. Quality or strength of flour long ago was defined as the capacity to produce large, well-piled loaves of bread. The ability to produce such a loaf depends upon both gas-producing capacity and gas-retaining capacity, for the dough rises as a result of liberation of carbon dioxide during fermentation, and retains its size and shape during baking because of the

peculiar properties of the gluten proteins which form the thin cell walls inclosing the gas.

Research has shown that the greater the protein content of flour the larger will be the loaf volume. Comparisons of protein content and loaf volume over a period of three years in the Testing Mill have shown a positive coefficient of correlation of 0.271 ± 0.038. Loaf volume, used in this way as a measure of flour quality, shows that high-protein flours are more valuable than low, and it is this principle which is at the foundation of the practice of paying premiums for high-protein wheat. The quantity of protein in wheat is the best single index to baking quality that we now have, and has the added advantage that it can be determined rapidly and accurately.

The character of the wheat of each new crop is so uncertain, yet so important, that the State Testing Mill began in 1924 making surveys of Minnesota wheat to determine the protein content of the crop in advance of the movement to market. Results of the first three surveys showed a significient difference in the supply of high-protein wheat. In 1924 the average protein content was 11.50 per cent; in 1925 there was a slight increase to 11.67 per cent, while in 1926 there was an increase of over 1 per cent, the average of over 2,000 samples collected systematically at different points in the state being 12.74 per cent. In 1927 the average protein content was 11.45 per cent; in 1928, 12.30 per cent. Reports of averages do not tell the whole story, for each year there are variations of more than 5 per cent in protein content of wheat from different localities.

Quantity of protein in wheat is not the sole important factor determining baking properties of flour. Conditions under which wheat is grown apparently are responsible for considerable variations in the quality of the protein constituents. There also are differences in the character of protein, which may be attributed to varieties of wheat. Gluten, which is formed by a combination of the proteins, gliadin and glutenin, although studied for many years, is still a subject for research.

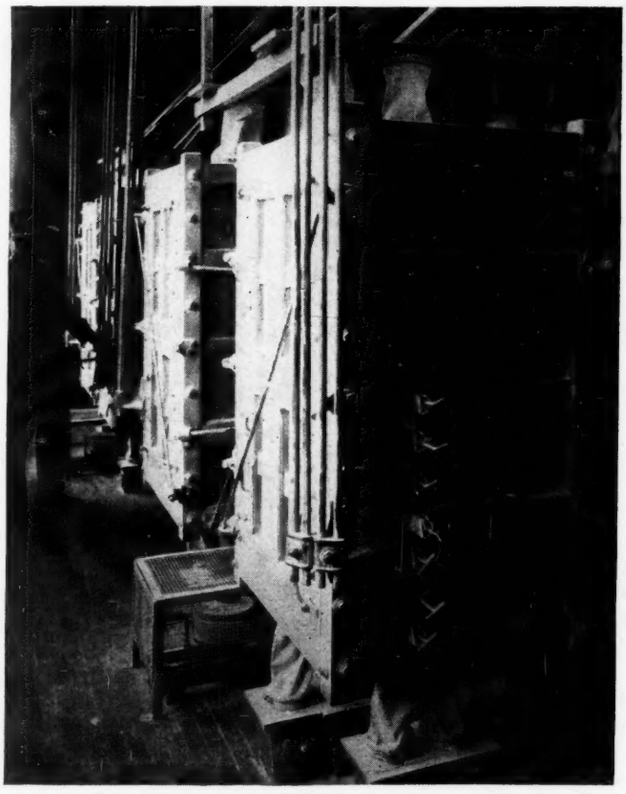
Sprouted Wheat Improves Quality of Bread

Deficiency in gas production, due to lack of diastatic enzymes, occasionally is a limiting factor in bread production. Judicious admixture of sprouted wheat has been found by experiment in the State Testing Mill and the University of Minnesota to increase diastatic activity, thereby improving the quality of bread. It has become a frequent practice in milling to incorporate a small percentage of sprouted wheat in the mill mix when certain types of wheat, sometimes called "gluten-bound," are used.

Practically all kinds of foreign matter reduce the milling value of wheat. Certain grains like oats, which differ from wheat in shape or size, are readily removed by cleaning machinery, while others, such as rye, can not be removed. Several kinds of weed seeds, including wild rose, kingheads, wild peas, are practically impossible of separation. The federal wheat grades recognize the difficulty of thoroughly cleaning wheat containing seeds resembling wheat kernels in size and specific gravity, by specifying a lower grade dependent upon the kind and percentage of the foreign matter.

Studies have been conducted in the State Testing Mill to determine the effects of admixtures of foreign matter. Rye was found to reduce the quality of flour when 3 per cent or more was present in the wheat mixture. Amber durum wheat mixed with common spring wheat in quantities of 10 per cent or more had an unfavorable effect upon the quality of flour. Similar tests with red durum wheat showed that 10 per cent or more of red durum caused the production of flour poorer in quality than that yielded by pure common spring wheat. Small quantities of certain weed seeds have much greater effect upon flour quality. Wheat containing only 0.56 per cent of wild vetch yielded flour with the characteristic odor of benzaldehyde, which was liberated from the cyanogenic glucoside present in the vetch. When the flour was baked, however, the odor was almost entirely dispelled.

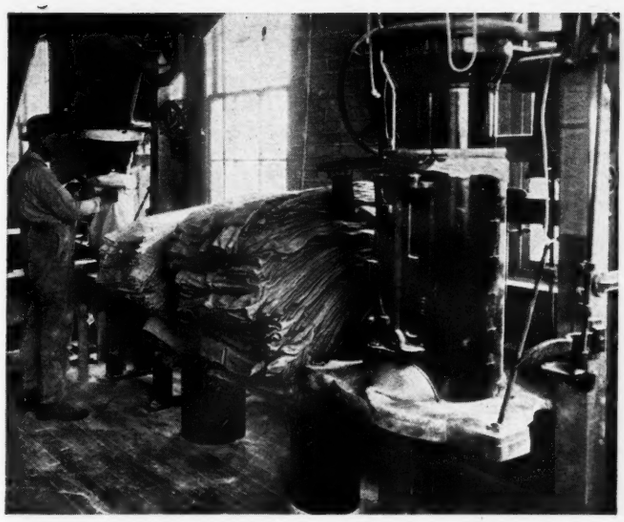
The screenings, which are classed as dockage by grain inspectors, contain a large variety of weed seeds, chaff, straw, dirt and the like. The removal of such material without loss of wheat presents a problem to the miller. Experiments in the Testing Mill show that the loss in cleaning wheat in preparation for milling almost invariably exceeds the percentage of dockage assessed by grain inspectors. The results of six years' operation showed an average cleaning loss of 4.65 per cent compared with 3.02 per cent assessed dockage. From these figures it is apparent that the mill received 3.02 per cent of the gross intake of wheat without cost, but at the same time paid for an additional 1.63 per cent of screenings at



In the sifters each stream flowing in at the top is divided into four portions: finished flour, coarse material to be reground, and two portions spouted to the purifiers.

the price of wheat. Screenings are either ground and mixed with the mill feeds or sold directly. In either event the income from the screenings has not always been found sufficient to cover all costs. Therefore, clean wheat always is preferred. Only when the percentage of dockage is high does it yield a profit.

Testing of new varieties of wheat is one of the important functions of this experimental flour mill. It is



The flour and feed packers; flour is usually packed in 98-lb. cotton bags, the feed in 100-lb. burlap sacks

futile for plant breeders to develop and distribute wheat varieties which are not suitable for milling and baking, for in the last analysis wheat normally sells for what it is worth for milling and baking. A number of unfortunate experiences in the past might have been avoided had the distributors of such varieties of wheat as Humpback attempted to fortify themselves with data from the mill and cereal laboratory.

At present it is the policy of most plant breeders to insure that a new variety will yield a good baking flour, in addition to its agronomic advantages. New varieties tested both for milling and baking characteristics have included Kota, Quality, Garnet, and Ceres. Arrangements are now being made to test Marquillo, a new rust-resistant wheat developed at the Minnesota Experiment Station, in comparison with the well-established variety Marquis.

The State Testing Mill serves not only as an experimental plant but is in operation regularly for the manufacture of flour and feed, although this phase of the work is incidental to the main purpose of the organization. It is obvious that in making large-scale milling tests quantities of products are produced in excess of the demands for laboratory tests. The State Legislature made a wise provision when the mill was established in authorizing the State Board of Control to purchase the products of the State Testing Mill to supply the state institutions, such as hospitals, asylums, and penal institutions. Production is limited to the demands of these institutions, whose requirements are now about 16,000 barrels of flour per annum. The elimination of marketing costs resulting from this arrangement aids materially in offsetting the higher costs of production naturally encountered in operating a small flour mill.

Shipment of flour for use in the bakeries of the state institutions requires as careful control in manufacture as in any commercial mill. To give entire satisfaction, a uniform flour of good baking properties must be supplied. At times uniformity is maintained only with difficulty, as the experimental work requires the purchase of nearly all types of wheat. This is accomplished, however, by careful blending of wheat and flour coupled with close attention to the sequence of wheat purchases of different grade and quality.

The wheat storage capacity in the mill, while limited, is divided into six bins, each with a feeder capable of adjustments, so that a wheat blend can be prepared using three or four different types of wheat. When experimental milling trials are made, the flour produced always is stored in tanks for blending later, after the wheat blend has been properly adjusted for inclusion of the test-run flour. In this control of uniformity in the flour the laboratory is indispensable.

Arrowroot or Arrowroot Starch? A Correction

Arrowroot importations into United States were reported in U. S. Commerce Reports for Sept. 17, 1928, as ranging in amounts from 14,646 lb. to 23,743 lb. during the period 1923 to 1927. These figures were quoted in *Food Industries* on page 78 of the November issue.

One of the principal importers of this product informed *Food Industries* that the quoted figures must be in error because his firm alone imported over 1,000,000 lb. annually. Upon investigation the following explanation is given by the Department of Commerce together with a table of figures that shows the quantities of arrowroot exported from St. Vincent:

A part of the arrowroot coming into the country has been declared as "arrowroot starch" and a much smaller part has been declared as "arrowroot." While it is true that arrowroot is a starch it is an erroneous declaration to describe it as arrowroot starch. On account of its small value as compared with the total imports into the United States the Bureau of Foreign and Domestic Commerce has never given any classification to arrowroot starch but has always thrown it into a general classification of "other starches," so that there has been no accurate knowledge of the exact quantity coming in.

It has now been agreed by the bureau of statistics of the Department of Commerce that in the future arrowroot starch shall be given a separate classification so that it will be properly accounted for.

The attached table taken from the official statistics of the Colony of St. Vincent shows that it claims to have exported 1,147,096 lb. to the United States in 1927. Arrowroot represents nearly 40 per cent of the total exports from the colony whereas the quantity imported into this country represents so infinitesimal a fraction of the total of imports into the United States that little attention has been paid to it.

Exports of Arrowroot From the Island of St. Vincent, British West Indies, for the Year 1927

(Report of the Island Government)

Destination	Quantity in Pounds	Value in Pounds Sterling
United Kingdom	1,346,885	£22,447
Canada	260,018	4,334
Antigua	4,000	67
Barbados	273,549	4,559
Grenada	2,240	37
St. Lucia	1,424	24
St. Kitts	224	4
Trinidad	42,346	706
British Guiana	32,552	543
Bermuda	2,240	38
Germany	17,584	288
Holland	65,320	1,144
U. S. America	1,147,096	£19,118
Total	3,195,478	53,309

Methods of

Controlling Insect Infestations

1—Various Forms of Infestation and Their Causes

By CHARLES H. PEET
Röhm & Haas Company, Bristol, Pa.

MAN'S supremacy over the whole animal creation is seriously threatened by the insects that promise, through their great fecundity, to defeat man in spite of his superior mentality. The universal problem raised by insect infestation has acquired rather unexpected seriousness for a number of reasons.

Probably one of the chief of these is to be found in the artificial conditions of modern life, which have resulted in largely eliminating the natural enemies that normally control the proliferation of insect pests. Thus, granaries, food warehouses, and food manufactories commonly are kept at nearly uniform temperatures well suited to the development of the insects that infest the materials kept in them. Also, strenuous efforts are made to prevent the invasion of such premises by parasitic or predaceous foes of the insect life developing therein.

Another important factor in encouraging the spread and development of the insect invasion is the almost universal contact which has been developed among all parts of the world. Pests that, through climatic or other conditions, are self limited in one locality are carried in shipments of material to new environments in which the inhibiting factors, which have restrained their development, are lacking and hence reproduction proceeds in unrestrained fashion. It is probable, too, that carelessness, as well as the difficulty of observing the presence of these minute invaders, plays a large part in enabling them to obtain a strong foothold before the seriousness of their presence is suspected. In the field of food and foodstuffs there is scarcely an item that does not have some general or special pest of its own.

The infestation of foodstuffs may be described under three general types. The term *superficial* is applied when the insects present are not specifically in or among the foodstuffs but rather make their homes in the same general locality and either cross the foodstuffs in their comings and goings or emerge from their hiding places to feed upon the materials available or in storage. The second class may be called the *intermixed* infestation, among which are placed those insects that make their homes directly among the materials on which they feed. The third class is that of the *penetrating* infestation, in which case the insects disappear within the foodstuffs upon which they feed and their presence is not distinguishable except when examination of the infested material reveals physical evidences of the insect's presence.

Under the names commonly employed by entomologists in their classification, the insects responsible for superficial infestation are familiar to every practical man who has anything whatever to do with foodstuffs. Among the principal offenders are the ants of various species. There is the little ant, sometimes called Pharaoh's ant, a small reddish-orange insect occurring in great numbers wherever it obtains a foothold. It is only about one-twelfth of an inch long and feeds on fats, meats, sweets, and similar foods. Lard left exposed for a period of time in a warm place is likely to be found teeming with these minute pests. Sugar or confectioners' materials also attract them strongly.

The little black ant, *Monomorium minutum,* of about the same size as Pharaoh's ant and found in practically the same habitat, prefers sweet foodstuffs for food, barrels or pails of sirup often proving the final resting place of whole armies of them. This pest will be found to make its home outside the infested building or in the soil beneath its basement floor if the floor is open or loosely constructed.

In certain localities the Termite, or white ant, is a serious problem because of the damage it does to buildings and equipment. Thus, timbers, vats and supporting members may be destroyed or so seriously weakened as to render them useless.

True flies are pests that work little harm or damage upon food materials although occasionally they prove something of a problem through their tendency to cause discomfort to the workers in shops and plants and more particularly through their marked affinity for sticky sweets, in which they are trapped. In most cases the probability that insects of this species will carry disease germs to foodstuffs is somewhat exaggerated for the reason that sources of infection are not commonly left accessible in even moderately well organized communities. Then, too, many foodstuffs pass through processes destructive to germ life. Admitting their complete harmlessness, however, it still is far from palatable to discover a fly in the fondant of one's chocolate cream or as a constituent of mince-meat.

The many little insects—thousand legs, "silver fish," and the like—dwelling in such damp dark places as the underside of wet or moldy boards, and to be observed dashing frantically away when the board is moved, are unpleasant reminders that the building in which they are living is not subject to proper sanitary control, but they seldom intrude themselves into the products being fabricated in those surroundings.

However, the presence of the various kinds of cockroach is not only indicative of filthy breeding places but it also constitutes a serious problem because of the fact that these insects do not possess the ability to escape

from steep-walled containers, into which they may have fallen, as could many other insects whose feet are equipped with sucking pads, or disks, and their inquisitiveness leads them to investigate the edibility of a wide variety of materials in which they may become incorporated in the course of manufacture. It is not uncommon to find a cockroach in bread or cake, and the injury to the reputation of the baker far exceeds, in dollars and cents, the outlay necessary to control the infestation of his premises.

There are several kinds of cockroaches, two or more of them commonly occurring in the same location. The most frequently encountered probably is the so-called croton bug, or water bug, which is known scientifically as *Blattela germanica*. This insect, which obtained its name from its early association with the Croton water works system in New York City, is, when mature, of a woody-brown color. The female carries an egg capsule, approximately rectangular in shape, designed to hold the eggs until they are practically ready to hatch. Then the capsule is dropped in some dark place and very soon the young roaches emerge.

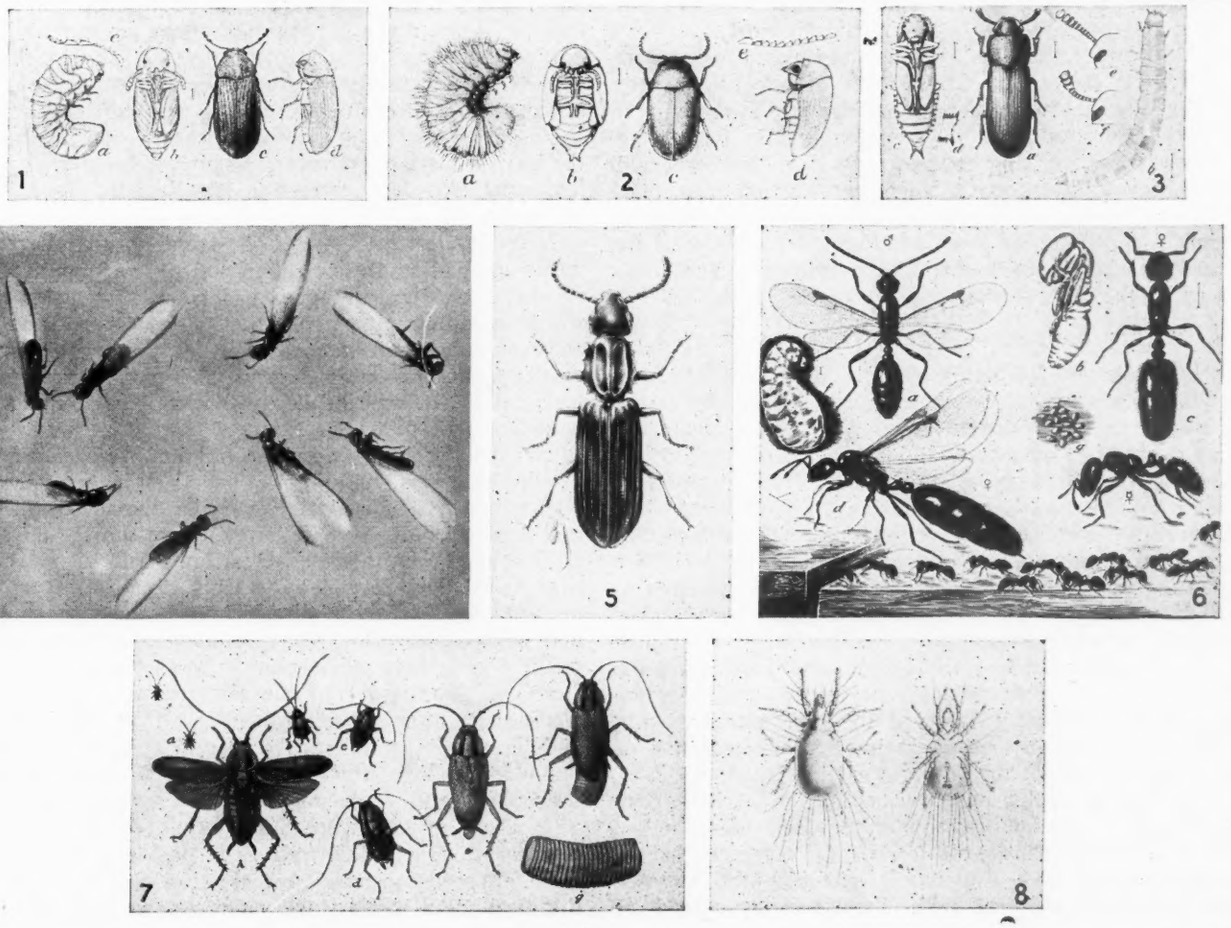
At this time they possess very little color and have few of the structural characteristics of the adult cockroach. They are flatter and more nearly oval in shape, but they possess the same remarkable activity shown by the full-grown insect. Technically, the young cockroach is called a nymph; not passing through a dormant, or pupal, stage. Instead, it grows until its skin becomes too tight for it, then this is shed and the nymph emerges a larger insect than before but again colorless, as when first born. On an average this process of growth and shedding is repeated about five times and from the fifth or sixth nymphal envelope emerges the full-grown cockroach.

The same life history applies to the very large and still more repulsive appearing American cockroach, *Periplaneta americana*. However, the appearance of the nymph is different and the egg capsule differs in shape and size. The roach attains a length of 2 in. or more, but, except under the most favorable conditions, is not as prolific as the smaller and more common German roach. The Oriental and Australian roaches also are fairly common but have not as yet come to constitute so serious a pest as the two that have been mentioned.

The insects found in cases of intermixed infestation are familiar in a general way, but usually their specific characteristics are not clearly defined in the mind of the untrained observer. Most commonly they appear to be rather small beetles or fairly small worms. As a matter of fact, under the general description "beetle" are included in the mind of the practical man both the true

Fig. 1—Drug store beetle; (a) larva; (b) pupa; (c) beetle; (d) side view of beetle; (e) antenna. Fig. 2—Tobacco beetle; (a) larva; (b) pupa; (c) adult, view from above; (d) adult, side view; (e) antenna. Fig. 3—Confused flour beetle; (a) adult; (b) larva; (c) pupa; (d) lateral lobe of abdomen of pupa; (e) head of beetle showing antenna; (f) similar view of rust-red flour beetle. Fig. 4—Winged adult termites. Fig. 5—Saw-toothed grain beetle. Fig. 6—Little black ant, which has a very sweet tooth. Fig. 7—German cockroach (a) first stage; (b) second stage; (c) third stage; (d) fourth stage; (e) adult; (f) adult female with egg case; (g) egg case enlarged; (h) adult with wings spread. Fig. 8—Grain mites.

Photographs from U. S. Bureau of Entomology



beetles and the various weevils. Similarly, the worms that are most abundant in foodstuffs are not worms at all, strictly speaking, but rather the elementary or larval stages of moths or beetles.

Weevils, found principally in grains, all possess a family resemblance in that their bodies are divided into a fore section and an after section roughly of the same size. The fore section generally bears a markedly elongated beak, or snout, projecting some distance from the eyes (in contradistinction to beetles proper, in which the eyes are set near the base of the antenna on rather flat or blunt heads).

The commonest of the weevils is the granary weevil, which is never more than about three-sixteenths of an inch long and is often smaller. It is found throughout bins or other containers of stored grains with no particular preference for any certain depth. It may be distinguished by its lack of wings and by the fine stripes running lengthwise along its fore section.

The rice weevil is not greatly different from the granary weevil, being darker in color and with well-developed wings and a spotted, rather than a striped, fore section. This weevil is one of the worst stored-grain pests, being especially abundant in warm sections, where it breeds continuously if not checked by cold weather, and its numerous progeny work havoc upon the grains in which they live. This weevil can fly for considerable distances and thus tends to spread its own infestation. Hence, premises freed of its presence and into which it has not been introduced by the inclusion of infested materials still become infested through its voluntary entrance.

The coffee-bean weevil, though a minor grain pest, assumes considerable importance to coffee importers and handlers. It is especially abundant in the Southern states and because it is a strong flier it easily finds its way to new localities and, because it enjoys a wide range of diets, it easily perpetuates itself despite the absence of the foods by which it is most strongly attracted. It differs from the preceding two weevils in having no proboscis and in being covered with a mottled light and dark brown pubescence. This weevil opens a hole in the kernels of grain or the coffee beans upon which it feeds, depositing its eggs in this hole. When these hatch, the larvae feed upon the substance of the home in which they find themselves.

Insects Found in Penetrating Infestation

Still another foodstuffs pest is the so-called Australian wheat weevil, more properly called the lesser grain borer. It is small, being about one-quarter the size of a grain of wheat, and has a slender cylindrical form. The head is relatively large and prominent, being equipped with powerful jaws. The females lay from three hundred to five hundred eggs, which are deposited singly or in clusters throughout the loose grain. Only a few days are required for the eggs to hatch, whereupon the tiny grubs, as they emerge, crawl actively throughout the grain, feeding on the flour produced in the course of the boring and feeding of the parent beetles, or themselves boring into grains which have been sufficiently damaged to make entrance easy. The grub ultimately enters completely into a kernel of grain and there enters the quiescent, or pupal, stage.

The grain moths, which constitute a serious pest, are undoubtedly familiar to everyone who has handled or stored any quantity of grain. Of these moths the commonest is the Angoumois grain moth, a small brownish-yellow insect with a total wing spread of about ½ in. When disturbed, these moths will be found flying rather unobtrusively in flour bins and above the surfaces of other grains. As is the case with most moths, the Angoumois grain moth itself does little damage to the grain, but the larvae, which emerge from its eggs, are voracious feeders, burrowing deeply into the kernels of the grain. Inside the grain the larvae pass through the pupal stage and, when their development is complete, push their way through the thin layer of the seed coat left by the feeding larvae and emerge to go about their business of laying more eggs.

More indiscriminate in its feeding habits and hence more generally destructive is the rice moth, differing little in size from the Angoumois moth but of somewhat darker color and of somewhat different structural appearance. This pest also works its damage through the activity of its larvae, which feed contentedly on rice, cocoa, chocolate, hard biscuits and the like. Their presence is indicated by a bulky webbing that they spin as they grow, knitting kernels of grain or particles of foodstuffs into the walls of the tubes so formed.

Another group of moths constitutes one of the most common and most serious problems for the miller or manufacturer of cereal products. These are the flour moths, which are so named because their larvae feed especially upon ground, broken or injured grains.

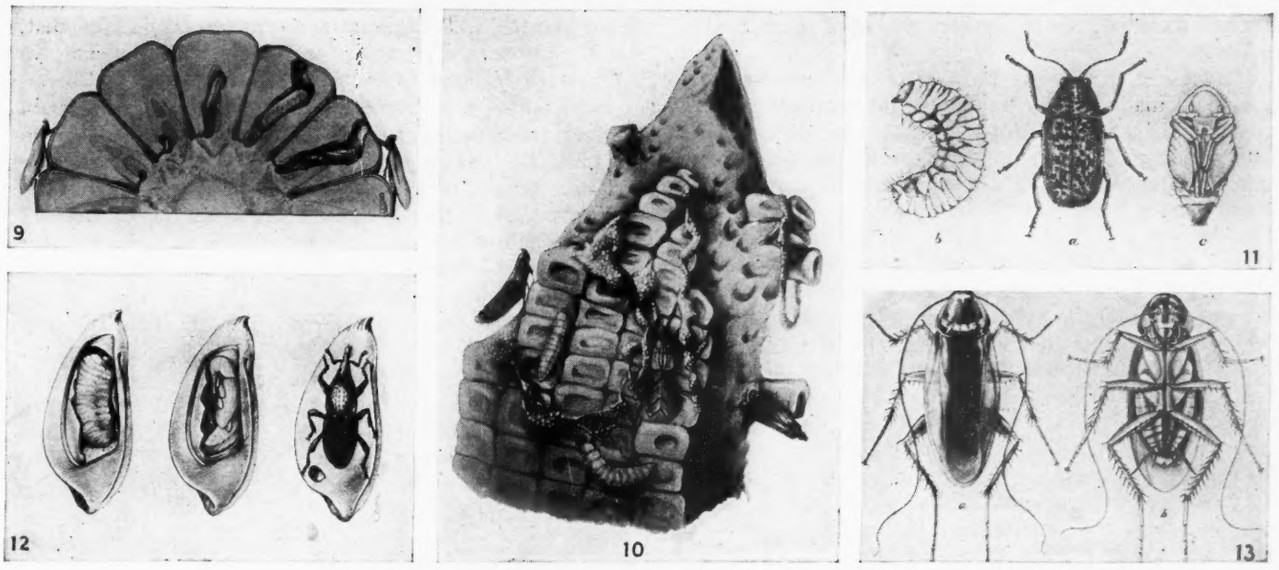
Indian Meal Moth a Busy Pest

The most widely distributed and probably most injurious of these pests is the Indian meal moth, easily distinguishable from other grain or flour moths by the peculiar markings upon its fore wings. These are reddish-brown with a metallic luster on the outer margins, shading off to a light gray on the inner ends. The female moth lays from three hundred to four hundred eggs, more or less at random, on the surfaces of food material most easily accessible, and within a few days the eggs hatch into small, whitish larvae. The larvae are indiscriminate eaters, feeding on broken grains, dried fruits and like substances. When full grown, the larva spins a silken cocoon about itself, entering upon its pupal stage, to emerge a month later as a full-grown moth.

In moderate weather the cycle from egg to full-grown moth occupies in the neighborhood of two months, but in warm weather the period of development may be shortened to four or five weeks. The presence of the larva of the Indian meal moth is detected by the thread that it spins and leaves behind wherever it crawls, the webbing in the case of heavy infestation becoming too abundant to escape detection.

Of about equal seriousness is the presence of the Mediterranean flour moth. This moth is somewhat larger than the Indian meal moth, lacking the distinctive markings that identify the latter. Like the Indian meal moth, the larvae of the Mediterranean flour moth spin threads as they travel. The webs resulting from the multiplication of these threads can become so profuse and matted that they not infrequently clog machinery to the point where it is necessary to shut down mills for cleaning. The larvae of the Mediterranean flour moth confines its attention almost entirely to cereal products and though it prefers finely ground materials, such as flour or meal in other forms, it also attacks ground bran, flakes and similar materials. This moth takes about nine weeks to pass from egg to adult, though in cooler weather this period is extended considerably.

Where seeds or grains are stored in cool, damp places the meal snout moth often constitutes a troublesome in-



Photographs from U. S. Bureau of Entomology

Fig. 9—Angoumois grain moth showing progressive stages in its development. Fig. 10—Indian meal moths, showing two well-grown larvae and three adults. Fig. 11—Coffee bean weevil; (a) adult; (b) larva; (c) pupa. Fig. 12—Granary weevil showing larva, pupa and adult. Fig. 13—American cockroach; (a) from above; (b) from below.

vader. It is about the same size as the Mediterranean flour moth, having a wing spread of about an inch. Its general appearance is more like that associated in the lay mind with moths than in the case of the two described above; that is, the body is practically shielded by the wings when the insect is at rest, the whole insect with its wings in the resting position forming a triangle. The characteristic pattern of its fore wings serves readily to identify it, being light brown in the center with two wavy, transverse white lines that mark the fore and aft limits of this colored area. Beyond these lines are the dark brown tips and bases of the wings.

The larvae of this moth form a peculiar tube, or tunnel, in which they live and from the neck of which they extrude their heads when feeding. When ready to pupate, they leave these tubes. The larvae of this moth are very likely to be found in locations that lead to molding of grain. Often the larvae cut their way through burlap sacking in the course of their development. This moth will be found in a great many food environments, peas, beans, corn and many other foodstuffs constituting equally satisfactory articles of diet.

The larvae of certain beetles are found in various cereal foodstuffs but in general the incubation period of these insects is rather long and the life cycle becomes so extended that these creatures never become serious pests. The little worms, which are larvae, reaching a length of about one inch and about as large around as an earthworm, require a full year to pass through the transition stage from egg to adult. The cadelle, though somewhat smaller, has a life cycle of about the same length.

One of the grain beetles that is commonly encountered multiplies rapidly, its development period ranging from three to six weeks. This is the saw-tooth grain beetle, deriving its name from the saw-tooth-like projections on the side of its thorax, or anterior, section. These teeth enable one to identify it very readily. It is about one-tenth of an inch in length, rather slender and flat and distinctly dark in color. It is nearly omnivorous, infesting grains, flours, meals, dried fruits and seeds. Unlike many of the other food pests, these larvae do not confine their attention to single units of the material upon which they feed but crawl about in lively fashion, nibbling here and there as fancy directs.

The square-neck grain beetle, which is to be distinguished from the saw-tooth grain beetle only by the absence of the toothlike projections along the thorax and the more nearly square shape of this section of the insect, feeds in much the same way as does the beetle just described. It is often found in the seed pods of plants that have not been shelled prior to receipt at the warehouse or factory.

No mill or factory or warehouse is ever entirely free from the confused flour beetle, *Tribolium confusum.* This little fellow is about one-sixth of an inch long and a glistening reddish-brown in color. It feeds generally on starchy foods, being undoubtedly the worst pest that preys upon prepared cereal foods. Its eggs are tiny and very difficult to distinguish from the material in which they are laid. They are sticky and hence tend to remain attached to the walls of containers in which they have been laid or to remain in cracks or crevices even though the containers are shaken or emptied. For this reason the refilling of such containers or bins is almost sure to result in fresh infestation of the new material. The larvae are small, not much exceeding three-sixteenths of an inch when ready to enter the pupal stage. These larvae feed on flour, grain dust, broken grains, flakes and other materials of similar description. The pupae into which they develop form cocoons and the total development period from egg to adult is at least a month, depending upon the temperature.

It seems almost a contradiction in terms that stored tobacco, which is the source of nicotine, should have its own serious insect enemy. Cigars are frequently completely riddled by a small oval beetle of a brownish-red color with a humpback head known as the tobacco beetle. It usually is about one-tenth of an inch long and in the absence of tobacco breeds in a variety of seeds.

Still more resistant and more nearly omnivorous in its feeding habits is the drug-store beetle, which is said to "eat anything except cast iron." It seems especially fond of medicinal herbs, spices, dried roots and all other varieties of drugs handled by drug importers or found in pharmacies. It chooses for its environment some dry,

organic material, there laying its eggs and passing its life.

Besides the insects already discussed, mention also should be made of the mites, a microscopic order of insects which, under proper conditions, increase with such rapidity as to produce "sweating" in the infested matter, thereby imparting a disagreeable odor in addition to the damage done by their feeding. As they grow these insects shed their skins, in heavy infestations the "casts" and the bodies of dead mites being found in fluffy light brown masses beneath the containers of material in which the mites have grown.

There are many other insect pests to be found infesting foodstuffs but to attempt even to catalog them would lengthen this discussion unduly. Those mentioned unquestionably are most common and, through their adaptation to the environments in which they grow and the rapidity with which they reproduce, they constitute the most serious problems in insect control confronting the foodstuffs handler or manufacturer.

END OF PART I

Canned Foods Exports Last Year 16 Per Cent Over 1927

WITH the exception of tomatoes, growing conditions for fruits and vegetables were good throughout the country during 1928, and large canning crops were harvested and packed. Prices remained at levels comparable with the preceding year and consumption increased both at home and abroad. Conditions in California and the West were particularly favorable and the total production in that area exceeded previous records. In California alone the fruit and vegetable pack reached a volume that has only once been exceeded, the higher pack in 1926 having been due to the large quantity of freestone peaches canned in that year.

The export trade reflected the abundant domestic supplies. Exports of all canned foods exceeded those of 1927 in volume by nearly 16 per cent. The total value was over $71,000,000, which compares very favorably with the previous year's total of $62,700,000, according to M. S. Hollingshead, canned foods specialist, U. S. Bureau of Foreign & Domestic Commerce, in *Commerce Reports*.

For comparative purposes, the movement of the main canned foods items for the past three years is shown in Table I. The general tendency to expand the exports of each item is noticeable. Of particular importance is the cessation in the downward trend in the exports of condensed and evaporated milk, which had existed for several years. Apparently the turn has been reached, for milk exports expanded during the past year. Very comfortable increases are recorded in the case of most canned vegetables, but these were overshadowed by the large gains in the canned-fruit exports.

The five leading consignee countries of exports of canned foods from this country taken together account for nearly 70 per cent by value of the total. The United Kingdom is far in the lead, taking roughly six times as much as Canada, the second most important country. These same countries are of similar importance when the volume of exports is examined. The total percentage going to them is 70. The United Kingdom still leads, although not quite to the same extent, owing to the larger proportion of the lower priced canned vegetables which are shipped to Canada. An opportunity to study this phase of the export trade is given in Table II, which includes detailed figures for three years.

Table I—Exports of Canned Foods from the United States, 1926-1928

	1926 Pounds	1927 Pounds	1928 Pounds	1928 Dollars
Meat:				
Beef	2,644,683	2,752,348	1,899,225	676,110
Pork	6,462,458	7,274,201	8,153,157	3,127,689
Sausage	3,754,852	3,844,420	2,037,954	682,490
Other	2,737,289	2,729,960	2,603,394	837,687
Milk:				
Condensed	38,710,654	34,886,581	38,762,549	6,191,185
Evaporated	75,838,409	68,048,211	76,788,833	7,904,541
Fish:				
Salmon	53,511,098	38,253,368	40,951,505	7,661,536
Sardines	71,285,456	79,439,503	80,253,474	6,522,711
Shellfish	3,443,164	3,863,323	4,730,944	1,011,106
Other	1,993,003	2,014,727	9,362,496	939,288
Vegetables:				
Asparagus	12,289,591	15,363,812	17,717,985	2,705,401
Beans	16,376,846	14,437,556	14,016,506	1,196,384
Corn	4,313,284	5,016,665	8,049,793	582,927
Peas	4,349,(33	6,108,704	6,487,092	574,818
Soups	22,341,954	23,695,365	28,278,931	2,603,442
Tomatoes	7,265,609	6,330,714	5,649,266	359,690
Other	4,411,154	9,904,557	10,965,193	670,223
Fruits:				
Apples and apple sauce	14,318,[illegible]96	13,877,611	21,446,530	1,187,762
Apricots	32,360,350	25,851,395	28,765,080	2,643,661
Berries	(1)	6,901,029	13,089,370	1,333,935
Cherries	1,916,664	1,802,188	2,202,453	345,856
Prunes	3,460,671	3,072,337	2,231,340	217,774
Peaches	66,599,128	78,199,945	96,237,096	7,667,410
Pears	51,227,411	61,889,768	78,265,549	7,506,627
Pineapples	31,120,905	46,003,028	54,394,244	4,885,206
Other	22,745,782	10,258,183	9,130,652	970,581
Total by classes:				
Meat	15,599,282	16,600,929	14,693,730	5,323,976
Milk	114,549,063	102,934,792	115,551,382	14,095,726
Fish	130,232,721	123,570,921	135,298,419	16,134,641
Vegetables	71,347,471	80,857,373	91,164,766	8,692,885
Fruits	223,749,417	247,855,484	305,762,314	26,758,812
Grand total	555,477,954	571,819,499	662,470,611	$71,606,010

(1) Not separately listed prior to 1927.

Table II—United States Exports of Canned Foods to Five Leading Markets, 1926-1928

Item and destination	1926 Pounds	1927 Pounds	1928 Pound
To United Kingdom:			
Peaches	53,003,195	60,005,451	71,315,430
Pears	44,634,891	55,375,021	70,554,825
Apricots	26,790,260	20,570,711	21,028,290
Pineapples	10,271,624	14,495,689	14,235,872
Asparagus	1,343,606	2,031,114	1,851,496
Soups	3,296,851	4,018,407	4,279,696
Beans	10,272,156	8,962,773	8,924,214
Peas	273,541	700,901	1,132,257
Tomatoes	106,479	509,280	2,406,537
Salmon	25,357,747	20,736,856	30,815,522
Sardines	3,285,534	2,819,107	5,466,372
Condensed milk	22,108	319,183	720
Evaporated milk	24,528,400	25,616,491	26,853,550
All meats	8,107,441	9,208,340	9,462,549
To Canada:			
Peaches	4,021,407	.5,530,951	7,788,933
Pears	970,737	876,628	1,144,031
Apricots	1,245,046	1,074,081	1,469,688
Pineapples	5,422,127	6,295,891	8,374,400
Asparagus	1,020,031	1,599,724	1,631,675
Soups	15,776,243	16,452,651	20,311,510
Beans	2,154,675	1,244,747	744,587
Peas	1,187,661	1,803,856	1,656,669
Tomatoes	321,963	228,247	383,530
Salmon	1,681,771	1,692,648	1,149,963
Sardines	2,624,301	1,383,790	2,146,596
Condensed milk	22,076	131,349	38,784
Evaporated milk	613,604	603,676	562,043
All meats	494,672	324,080	592,352
To Philippine Islands:			
Peaches	270,532	307,810	326,642
Pears	59,809	92,161	51,015
Apricots	27,131	56,445	31,642
Pineapples	180,520	286,287	230,136
Asparagus	148,961	149,650	207,633
Soups	325,741	171,424	223,915
Beans	431,419	390,556	549,911
Peas	472,574	548,596	847,302
Tomatoes	396,459	296,931	373,304
Salmon	8,140,977	4,741,344	258,357
Sardines	11,938,395	12,688,711	11,052,165
Condensed milk	6,957,683	7,058,819	7,641,097
Evaporated milk	12,687,088	13,230,906	15,649,075
All meats	431,186	493,563	556,627
To Cuba:			
Peaches	1,966,299	2,563,327	1,675,989
Pears	1,430,743	1,352,370	1,178,119
Apricots	20,682	20,922	12,725
Pineapples	9,723	9,734	27,215
Asparagus	230,457	205,674	233,050
Soups	236,718	201,511	150,144
Beans	376,719	431,695	97,256
Peas	785,223	1,473,596	1,144,468
Tomatoes	2,282,340	2,833,916	96,006
Salmon	639,796	312,383	316,456
Sardines	1,713,599	1,775,230	768,523
Condensed milk	14,915,233	11,338,178	11,267,475
Evaporated milk	3,445,406	2,072,487	2,883,857
All meats	3,294,289	3,166,684	662,897
To Germany:			
Peaches	481,442	813,847	1,771,358
Pears	185,057	252,051	407,419
Apricots	245,974	372,466	606,176
Pineapples	5,289,665	13,857,934	17,754,472
Asparagus	161,216	1,309,673	1,414,851
Soups	1,796	2,809	1,789
Beans	None	590	1,157
Peas	13,514	19,014	25,204
Tomatoes	984	1,665	1,488
Salmon	181,461	76,358	62,210
Sardines	178,535	320,681	239,618
Condensed milk	8,890	None	15,306
Evaporated milk	4,804,730	70,560	66,740
All meats	14,973	8,208	21,776

German Agricultural and Dairy Practice Deplorably Backward in Some Respects

Sound Leadership in Department of Agriculture of German Republic Is Most Pressing Need, According to Prominent Banker

By a Special Correspondent

THE visit to Germany of a commission of dairy scientists and industrial leaders announced on page 187 of January Food Industries has culminated in a report, recently published in Germany, entitled, "Die Erzeugungs- und Absatzverhältnisse der deutschen Vieh-und Milchwirtschaft." It is now possible to review the findings and recommendations of this group, which consisted of G. F. Warren, of Cornell University, chairman; C. E. Gray, president of the Golden State Milk Products Company, of San Francisco; N. W. Hepburn, manager of the Peoria Creamery Company, of Peoria; J. C. Marquis, of the United States Department of Agriculture; H. W. Mumford, dean of the College of Agriculture of the University of Illinois; F. A. Pearson, of Cornell University; H. A. Ross, also of Cornell; I. C. Weld, manager of Chestnut Farms Dairy Company, Washington, D. C.; F. B. Morrison, then director of the New York State Agricultural Experiment Station, now at Cornell, and Otto Rahn, of Cornell University, as secretary.

The report gives general advice, in a cautious and suggesting way, on some problems, and very specified advice, frequently going into the most minute details, on other subjects. A reconstruction of the German dairy and livestock situation from this report is possible if one has a general conception of German agriculture. The report has the great advantage over many others that it represents facts. It is quite evident that a country asking advice cannot very well hide facts or color the situation too favorably.

Bankers Discuss Agriculture

For a complete understanding of the reasons which brought about the investigation by this committee, it is essential to read the report of the fall meeting of the German Bankers Association at Cologne, in 1928, where an entire day was devoted to discussion of the agricultural problems. Through the discussions runs, as a red line, the realization that the present agricultural crisis has nothing in common with ordinary periods of agricultural depression that are brought about by slow fluctuations in prices, or by similar causes of a passing nature, and it probably is not a mere accident that the chairman of the German group which extended the invitation to the American commission was the same Dr. Solmssen who, as manager of one of the largest German banks, Die Disconto-Gesellschaft, of Berlin, was the principal speaker on the agricultural situation at the bankers' meeting.

The present German agricultural depression became conspicuous soon after the period of inflation was over. Whether it also existed during the inflation period is difficult to say because everything was abnormal then. The depression has steadily increased, however, and it is natural to consider it primarily as a post-war effect. Germany, once a rich country, has lost her wealth. The government got rid of its enormous internal indebtedness by inflation, but this has impoverished the people.

It seems quite safe to state that all reparation payments, so far, have been met with money borrowed from abroad. Germany's foreign indebtedness has increased at practically the rate of the reparation payments. But Germany lost more than money: she lost a very large part of her iron and coal mines, she lost all the colonies, she lost her merchant fleet, and she lost several agriculturally important provinces, largely to the thinly populated Poland. Germany imports more food now than before the war. The pre-war rate of food imports of about $400,000,000 annually was more than doubled in 1927.

It seems, however, that this situation should not have hit the farming population harder than any other occupations. If much food is imported, there must be a large demand, and the farmer should find a ready market. Yet, the German farmer complains about lack of markets and about low prices. Some of the countries shipping meat and dairy products to Germany are neither climatically better situated nor have they lower wages; the only difference is lower taxes. What is possible in Holland or Denmark, theoretically should be possible in the German Rhine valley and in Holstein. Whenever a foreign product is preferred to the domestic product, it means either cheaper goods or better quality.

The lack of good markets for German agricultural products is not a direct result of the war, but an indirect one. Germany, in some respects at least, has not kept pace with recent developments in other agricultural countries. Among the outstanding neglected fields is the city milk supply and the organization of co-operation and of marketing. Dr. Solmssen's address to the bankers showed that he realized the weak points of German agriculture, which probably accounts for the composition of the commission, which consisted of four specialists in economics and marketing, two livestock experts, three dairy managers, and a bacteriologist.

The report states, not bluntly but plainly enough, that German agricultural practice and farm management and marketing methods in certain lines are from 10 to 15 years behind the times. This does not, however, pertain to all lines of agricultural endeavor for many things are highly praised in the report; many fields of agricultural activity are as well worked out as can possibly be expected. But in other respects, especially in city milk supply and in livestock marketing, the lack of efficiency is very plainly noticeable.

Dr. Solmssen's address to the German bankers placed the responsibility for this state of affairs to quite an extent upon the lack of leadership in the German Department of Agriculture. He contrasted the indifference of the German government offices with the activity of corresponding departments in the United States, where important measures for the future are planned by far-seeing men. Failure to plan for the far future in German government offices can be understood, nevertheless, if one realizes how many times since the revolution the secretaries of agriculture have been changed, some of them remaining in office for less than a year.

German Progress Halted by War

In the 15 years in which Germany could pay but little attention to improvement in agriculture, on account of war, revolution and inflation, American agriculture has undergone the most marvelous changes, in general methods of production as well as in methods of marketing.

The visiting commission had been asked to investigate especially the production and marketing of milk, of dairy products, and of meat. The report shows that the two factors to be improved above all are the average milk production per cow, and the quality of the city milk supplies. The latter lack in several respects: there is no general milk law (it is being prepared now); there are some serious omissions in the milk ordinances, especially with respect to bacteriological standards; there is a general lack of understanding of the first things about bacteriology on the part of the consumer as well as with the farmers and milk plant managers; there is a lack of medical supervision, and of medical encouragement and indorsement.

The dairy scientists have not yet been able to obtain the recognition of the holding process of pasteurizing milk as a legal method of pasteurization. The veterinarians fight the holding process, and are opposed to any pasteurization for city milk, while all milk, skim milk and whey returned from creameries to farms for livestock feeding is required to be pasteurized by the flash method. It seems strange that the veterinarians have so much influence upon city milk supplies while the medical profession as a whole shows no great interest in this question. From this viewpoint it is

greatly to be regretted that no medical milk expert was among the members of the commission.

Two great handicaps contrast the German city milk supply with that in the United States: one is the dominance of bulk milk, and the comparatively small percentage of bottled milk, and the other is the method of distributing the milk through a large number of independent milk dealers. It is an exceptional case when a milk plant delivers milk directly to the consumer; ordinarily, the dealer buys the processed milk from the milk plant and sells it at his risk, as an independent business man. The quantity of milk handled by one dealer usually is very small, 100 gallons being a very high average and some of them handling not more than 15 gallons a day.

The great detail with which the milk is treated in the report shows distinctly that the operations involved in milking at the farm—the handling and shipping of the milk, and also the processing at the milk plant—can be greatly improved.

The manufacture of butter had been of quite high standing before the war. The great deficiency in milk during war and inflation, as well as the high prices paid for any food regardless of quality during the years of blockade, had a bad effect on habits of butter making. At present, imported butter sells at a higher price and is in greater demand than German butter. But, on the other hand, in some of the Prussian provinces, the chambers of agriculture have successfully organized special brands manufactured under continuous supervision. Butter of a greatly improved quality has begun to find a ready market and the prospects for a high quality of butter throughout Germany are good. Here, however, as in the problem of the city milk supply, the greatest obstacle to improvement is found in the multitude of very small butter factories, too small to afford good equipment and well trained help.

Cheese making is back to the old high standard. The commission found nothing to suggest except that cottage cheese as ordinarily manufactured was too high in acidity, and that a milder product probably would sell better.

Condensed milk, evaporated milk and dry milk, of course, are not manufactured to any appreciable extent in a country importing large quantities of dairy products. The ice cream industry is not developed and offers opportunities, although not nearly to such an extent as in the United States, partly on account of the cooler climate and partly on account of competition from the sale of beer and wine.

Skim Milk an Important Item

Skim milk is more important in Germany than in America. Considering the very close margin with which German farmers have to figure, the price obtained for skim milk may determine profit or loss. The best outlet for it at present is a very dry cottage cheese which can be stored and is manufactured into a ripened sour milk cheese, called "Harzkäse." In those districts where skim milk is used extensively for stock raising it is valued so highly that its price is prohibitive for most of the purposes for which it is used in America. The commission suggests using it eventually in the dried form for bread baking and ice cream or to manufacture casein when there is an irregular oversupply in the summer months only.

The other large problem in the German dairy industry is the improvement of the dairy cows. The average milk yield per cow is only about 4,400 lb. The total milk consumption, figuring butter and cheese on the basis of the milk needed in their manufacture, is 49,000,000,000 lb.; of this, 41,000,000,000 lb. is produced in Germany. If the milk yield per cow could be increased 400 lb. per year, Germany would not have to import any dairy products. "This could be accomplished within one year provided that every farmer would feed his cows better, and would give them the necessary extra care."

The ultimate problem, therefore, is one of education and psychology. Attention is called to the extension service of the American agricultural colleges which seems to be unknown in Germany.

German Hogs of High Quality

The meat situation is much better than the milk situation. The report accords high praise to German hogs, which are more uniform and better meat animals than in the United States. In cattle the line between beef and dairy types is not sharply drawn. Practically all breeds, even the Holstein cattle, which are, by far, the dominant type of the North-German plains from the Dutch to the Russian border, are not pure dairy types, and the highest-prized animals distinctly show that they are meant to be used for beef after the flow of milk has ceased to be profitable. The emphasis of breeding, however, is on the dairy type. On the small farms of central and southern Germany, cows are used frequently for work. This results in plenty of beef, but, naturally, very little beef of high quality.

The number of sheep raised in Germany is decreasing steadily. There is very little room for sheep in an overcrowded country like Germany. The poultry business is just beginning to be developed, and the American model can easily be recognized in German poultry farms. According to the report, poultry raising should be quite profitable in Germany.

In combating animal diseases Germany has for a long time set the standard. There seems good hope that even the foot-and-mouth disease, which is the greatest pest to the European livestock industry, will be conquered soon by a serum. Contagious abortion has done just as much harm over there as in America, and no radical means for its suppression has yet been found. The progress in tuberculosis eradication is not as great as here. During the war, tuberculosis spread rapidly, and the number of reactors to the tuberculin test is so great that it cannot be used to separate healthy from infected cows. The American method of establishing areas free from tuberculosis, and extending these areas until entire states will be free from cows reacting to the tuberculin test, has not yet been introduced in Germany. It seems questionable whether this method would be applicable because it can be accomplished only if the farmer is paid damages for all slaughtered reactor cows—a procedure which would entail an enormous expenditure.

Grading Standards Lacking

The report dwells further upon the problems of marketing. It emphasizes the need for establishment of legal standards of grades for all kinds of products, for there seems to be no such laws in Germany for grading agricultural products. The development of such standards, the methods of enforcing them, and the advantages to be derived from this standardization are discussed in detail. The report deals in a casual way with the problems of warehousing and cold storage, credits, labor efficiency, co-operation, land policy, statistics, and agricultural education and research.

Germany was once the leading country in agricultural progress. Liebig discovered the use of artificial fertilizers; Fleischmann was the first dairy scientist; even before Babcock, in agricultural bacteriology, in plant pathology, in genetics, Germany was far ahead of the world 20 to 30 years ago. The American co-operative societies of farmers were at first direct copies of the German models. The report acknowledges all this with a vote of thanks, and considers its work "a friendly exchange of knowledge."

Dynamite

Some people consider research a dull and sleepy affair. To me, research is full of dynamite. In the hands of a competitor it can strew your own business path with heartbreaking obstacles. Used by yourself, it can blast your way to success. If you are not using the research method to find new and better ways of manufacturing and selling your products, if you are not experimenting to find new products which you can profitably handle, now or in the future, your competitor is doing so, make no mistake about that.—*A. Lincoln Filene.*

Erratum—A slight omission was made in the Navy Ration, as outlined on page 388 in June Food Industries, the item of fresh meat having been overlooked. The allowance for meat as stated in the Navy Ration is: 1 lb. canned meat; or 1¼ lb. salt meat; or 1¼ lb. smoked meat; or 1¾ lb. of fresh meat."

ABSTRACTS · OF · CURRENT · LITERATURE

STERILIZING LIQUIDS. Georges Lakhovsky. *Comptes rendus,* April 15, pp. 1069-71. The bactericidal effect of a high frequency circuit, applied with the aid of a non-oxidizing metal, such as silver or an oxidation-resisting alloy, can be utilized for sterilizing liquids for human consumption. It may be expected to be particularly useful for obtaining safe drinking water from wells, rivers or other sources which may be contaminated, for construction gangs, for armies in the field, etc.

* * *

RIPENING OF LEMONS. Guido Ajon. *Rivista italiana delle essenze e profumi* 11, 89-92 (April, 1929). Chemical changes involved in the ripening of lemons are reviewed, under the headings: pulp and juice; ash; analytical methods; analytical results; composition of lemon pulp. Determinations made in the pulp and juice include nitrogen, cellulose, pentosand, ash, chlorine, free acidity, reducing sugars, soluble pectin, protopectin and residue after drying at 100 deg. C. Methods for these determinations are described. Changes in these quantities as ripening progressed are compared and discussed.

* * *

INFLUENCE OF SUPERHEATING ON THE ANTIRACHITIC PROPERTIES OF IRRADIATED FOODS. A. L. Daniels and Dorothy Jordan. *Proceedings of the Society for Experimental Biology and Medicine,* 453, vol. 26, March, 1929. Tests included the effects of addition to the ration of (1) boiled milk; (2) irradiated boiled milk; and (3) irradiated milk which was subsequently autoclaved at 15 lb. pressure for 1 hour. In one series of tests the irradiated ration was autoclaved at 15 lb. pressure for 6 hours. The results show that superheating, at least to the extent involved in the experiments, does not affect the antirachitic properties of irradiated foods.

* * *

SOME COMPARISONS OF THE NUTRITIVE VALUE OF WHOLE WHEAT BREAD AND WHITE BREAD. Sigfred M. Hauge and Aneta P. Beadle. *Journal of Home Economics,* 21, 199, March, 1929. Feeding experiments on albino rats have shown that whole wheat bread is superior to white bread as a source of vitamin G (anti-pellagra vitamin), proteins and minerals. However, "it is not necessary to advocate the use of whole wheat bread. The dietary habits of the American people are such that any deficiencies of one food item, as bread, may be amply supplemented by the other foods—eggs, dairy products, and vegetables. But where bread constitutes an unduly large proportion of the diet, then the deficiencies of white bread may lead to malnutrition which could have been prevented by the use of whole wheat bread."

FRUITS, VEGETABLES AND THEIR PRODUCTS. Report of the Committee on Nutritional Problems, presented to the Food, Drugs and Nutrition Section of the American Public Health Association, at Chicago, October, 1928. The report suggests the need of a thorough study of the comparative nutritive value and vitamin content of tree or vine-ripened fruits and vegetables and those that are harvested and ripened under artificial conditions. It reviews the work of Rosa at California on tomatoes and citrus fruits ripened in this manner, and also the work done at Massachusetts Agricultural College on cranberries which indicated that better results were obtained with vine ripening. The work of the mobile field laboratory of the National Canners' Association also is discussed, as well as waterless processing of canned vegetables and the development of special inside enamels for cans that prevent discoloration of the contents by iron sulphide.

* * *

BAKE OVEN PERFORMANCE. J. F. Aicher. *Industrial Gas 7,* No. 11, 20, May, 1929. Major factors in performance of bake ovens include first cost, ratio of floor space to capacity, fuel cost per pound of product, operating and maintenance costs, heat control and total (over-all) operating expense. High operating cost may even be a cause of poor quality of output—e. g., when overventilation is permitted. Thermostatic control and proper design for efficient combustion are necessary for minimum operating costs. A curve chart is given, showing fuel consumption of a gas-fired Baker-Perkins oven of the modern traveling-tray type, in terms of pounds of finished product and per cent capacity utilized in 8-hour production.

* * *

STRUCTURE OF FATS. T. P. Hilditch. *Chemistry and Industry* 48, 212-6, March 1, 1929. Studies have been made of the chemical structure of natural fats, and the manner of combination of the complex glycerides of saturated and unsaturated fatty acids. Ratios of saturated to unsaturated acids, and like topics, have been thoroughly studied for cacao butter, palm, sperm and the commoner seed oils. While synthetic fats can be produced on a commercial scale from coal or petroleum, it is not probable that they can ever compete with natural fats.

* * *

SALT AND SALT. B. Bascom. *National Miller,* 34, 19, March, 1929. Salt manufacturers offer a variety of grades and types of salt adapted for various uses. The author discusses in detail the type of salt most suitable for use in self-rising flour, and recommends one that contains approximately 1 per cent of a suitable filler, preferably tricalcium phosphate.

FISH MEALS. T. Ingvaldsen. *Canadian Chemistry & Metallurgy,* 13, 129-31, May, 1929. The effect of putrefaction has been studied with respect to nitrogen partition, composition and feeding value of fish meals and stock feeds containing them. In all non-putrid meals free from sperms the analyses for tyrosine, tryptophane and cystine were nearly uniform. One of the results of putrefaction is to lower the contents of all three of these amino acids. Since they are essential to nutrition, it is evident that for this reason alone putrefaction should be avoided in feed manufacture. Another difference between putrefied and non-putrid meals is that the former give a higher result for protein when calculated by the N factor (6.25) than when determined by difference (subtracting moisture, ash and ether extract from 100 per cent). With non-putrid meals the two methods agree.

* * *

OZONIZING. A. Vosmaer. *Chemisch Weekblad,* 26, 184-6 (March 30, 1929). Among the substances which can be successfully bleached or refined by treatment with ozone are palm oil, soy bean oil, sugar, starch, flour, milk and wines. For example, corn starch can be made fully as white as rice starch, and at the same time its nitrogenous impurities are destroyed by the ozone. For bleaching flour and sterilizing milk, other methods are preferred and for practical reasons ozonization is not commercially feasible. Sugar, however, can be both deodorized and sterilized by ozone. For spirituous beverages, the principal benefit of ozonization is the accelerated aging effect.

* * *

DETERIORATION OF FATS. W. L. Davies. *Chemical Age,* 20, 489-92 (May 25, 1929). There are two main causes of deterioration of the edible fats and oils: oxidation and attack by micro-organisms. Atmospheric oxidation may be accelerated by heat, light, acidity and certain catalysts. The first effect is on taste and odor; as the rancidity increases the color and consistency also suffer. The autocatalytic nature of the oxidation is shown by an "induction period" in which the velocity is very low. Then as the oxidation products begin to exert their catalytic effect, the rate increases more and more rapidly. The lipoids commonly present in unrefined fats tend to accelerate oxidation, shortening the induction period; but the traces of metals (usually in the form of soaps) which find their way into fats or oils during refining or processing are much more active than the lipoids as catalysts. Copper is the most potent of the metals; as little as ½ part per million may perceptibly increase the rate of oxidation. Iron, nickel and other metals are also harmful, but less so than copper. Great care should be exercised

in processing fats where contact with metal is necessary, especially in the case of copper; and the principal essential is to keep down the acidity of the fat. Tests for auto-oxidation, rancidity and the keeping qualities of fats are discussed. There is need of a test by which the tendency of a fat or oil to deteriorate can be ascertained. Deterioration of fats by bacteria or molds is quite different from oxidation; and organisms, when present, prevent oxidation by using up the available oxygen. Pasteurizing is helpful, but paves the way for oxidation, and so proper precaution must be taken against both forms of attack. This explains why cold storage alone is not sufficient protection.

* * *

GRAINING SUGAR. J. P. F. Huese. *Verslag van het Tiende Congres, Algemeen Syndicaat van Suikerfabrikanten in Nederlandsch-Indie,* 1928, pp. 95-122. A laboratory scale study of boiling and graining operations indicates that successful graining requires that supersaturation of the sirup be maintained within rather narrow limits. The Brendel brasmoscope was adapted as a reliable and easily used instrument for measuring supersaturation. Crystal growth from a supersaturated solution differs from condensation of a supersaturated vapor in that energy is consumed in the growth of new crystal planes. This limits the rate of growth and so influences the graining process. Discussion of the theory of supersaturation is supported by crystal photographs and by tables of brasmoscope data.

* * *

WHEN ARE MEATS OR FISH SPOILED? *American Journal of Public Health,* Vol. 19, p. 389, April, 1929. Report of the committee on meats, fish and shellfish, presented to the Food, Drugs and Nutrition Section of the American Public Health Association at Chicago, October, 1928. A review of the correlations between the various chemical tests for spoilage and the evidence furnished by the senses, indicating definite progress in our knowledge, but likewise a great need for further researches on the definition of spoilage and for simple rapid tests. Members of the committee were Carl R. Fellers, Albert C. Hunter, and F. A. Korff.

* * *

THE DANGERS OF CERTAIN MINERAL BAKING POWDERS BASED ON ALUM, WHEN USED FOR HUMAN NUTRITION. G. Schaeffer, G. Fontes, E. Le Breton, Ch. Oberling and L. Thiovolle. *Journal of Hygiene,* 28, 92, August, 1928. Feeding tests were made with mice using four different diets: (1) yeast bread, (2) yeast bread containing 9 per cent additional saline mixture, (3) bread with alum-phosphate baking powder (containing 4.4 per cent aluminum), and (4) same as (3) but only 1.3 per cent of aluminum. The results of group (4) compared favorably with the two control groups, (1) and (2). In group (3), however, the birth rate was considerably less, and the death rate during the first week was 23 per cent, almost four times the death rate of 6 per cent for group (1), and more than twice the death rate of 10 per cent for group (4). The authors explain the results as due to the elective, specific action of the aluminum on the ovary.

* * *

ZINC IN FOODS. Gabriel Bertrand and Boje Benzon. *Bulletin de la Société Chimique,* 45, 168-75, February, 1929. Since observations made in Europe in recent years have indicated that minute amounts of zinc have an important part in nutrition, a search for natural sources was made by analyzing many plant foods for zinc. The result gives first rank to leguminous seeds (from 20 mg. per kilogram in soy beans to 45 in peas and over 50 in beans). Next come the cereal grains, with 12 to 20 mg. per kilogram. Bulbous roots, such as onions, have 10 or more mg. of zinc per kilogram; so do some mushrooms. Leaves and other plant parts rich in chlorophyll and used for food (lettuce, spinach, etc.) have in many cases about 5 to 10 mg. per kilogram. Fruit pulps, tuberous roots, citrus juices and fleshy leaves poor in chlorophyll are commonly very low in zinc content.

* * *

PACKAGING LARD. Alan L. Porter. *Oil and Fat Industries* 6, No. 5, 19-21, 43, May, 1929. Early development of containers for solid food fats is traced, from the first crude wooden cylinder to the wooden barrel and to metal barrels and drums. Modern packaging for the retail trade, in paper cartons and in steel or tinned pails and cans, also is described. Automatic filling and sealing machinery has greatly advanced the art of retail packaging. Packers should know the proper conditions of temperature and humidity for their cooling and filling rooms and should maintain strict control. Even static electricity has been known to cause deterioration of packaged lard, and should be prevented by grounding the equipment.

* * *

EVAPORATED MILK. E. F. Deysher, B. H. Webb and Geo. E. Holm, *Journal of Dairy Science,* 12, 80-89, January, 1929. Heat stability of evaporated milk is greatly influenced by the temperature of forewarming. Homogenization also has much influence, causing lowest stability when the forewarming temperature is 60-65 deg. C., and distinct changes in heat stability at other forewarming temperatures. In general, forewarming 10 min. at 70 deg. C. decreases the heat stability of the evaporated milk; higher temperatures increase it. The forewarming must not be long enough or hot enough to adversely affect the body of the product.

* * *

DETERMINING THE SHORTENING VALUE OF FATS. C. E. Davis. *Bakers Weekly,* 61, 85, March 9, 1929. A detailed description is given of the Davis "Shortometer" used in this determination. Standard baking procedure is followed in the preparation of samples to be tested. The instrument measures the breaking strength in pounds of each individual cake or biscuit. A standard dough formula is also given.

* * *

SUGAR FACTORY CHARTS. Q. A. D. Emmen. *Archief voor de Suikerindustrie* 37, 382-6, March, 1929. Use of graphic methods is discussed with reference to refinery practice in the beet-sugar industry. One chart should show for any given time the stock of beets one year old. There should also be a straight line showing rate of grinding (assumed to be constant in a given campaign), beginning at a time utilizing beets at least 13 months old. From these two a curve should be plotted showing the age of the ground beets at any time. Examples are cited showing how charts thus made can be used in the refinery; and curves plotted as suggested are shown.

* * *

FOOD PRODUCTION. A. Behre. *Chemiker-Zeitung* 53, 217-8, 238-9, March 16 and 23, 1929. One of the principal aids in modern food manufacture is the judicious use of protective colloids for maintaining desired properties or for imparting such properties. True colloids which are useful in this way include gelatin, starch, vegetable and animal proteins, agar, gum tragacanth, and pectin. Glycerin and starch sirup are useful in maintaining the taste and other properties of fermented beverages. Dried skim milk is helpful in chocolate, starch sirup in honey, agar or gelatin in marmalades, tragacanth or starch (about 0.6 per cent) in ice cream, and so on.

* * *

CASEIN SYSTEMS. Martin H. Fischer and Marian O. Hooker. *Kolloid-Zeitschrift* 47, 193-206 March, 1929. Various acids and bases are able to form, within a considerable concentration range, gel systems with neutral casein. This is a specific effect, not a function, of pH value. Acids or bases which have this property combine with casein to form salts such as the alkali metal caseinates or casein chloride. Salts may react in such a system, by forming a new casein compound of different solubility or by combining with the solvent. Explanation is offered, in terms of such reactions, for viscosity changes and such phenomena as gelatinization, precipitation of a solid phase, syneresis, etc.

* * *

WATER VAPOR REFRIGERATION. R. Follain. *L'Industrie Chimique* 16, 129-33, March, 1929. The Scam-Follain refrigerating machine, with multiple-stage evaporator and condenser, is described and illustrated. The idea was proposed by Atkinson in 1886, but at that time it was not feasible to provide a high enough vacuum so that a steam ejector could be effectively used as condenser. The Leblanc pump, invented in 1904, led to the development of the Westinghouse - Leblanc refrigerating machine. The design and operation of this machine are explained, and compared with the later design of Scam-Follain. Some applications in industrial processes are cited.

· CRITICAL · BOOK · REVIEWS ·

ANNUAL SURVEY OF AMERICAN CHEMISTRY, VOL. III. Edited by Clarence J. West under the auspices of the Division of Chemistry and Chemical Technology of the National Research Council. The Chemical Catalog Company, Inc., New York, 1928, 384 pp. Price $3.

THE first volume of the Annual Survey of American Chemistry was an experiment by the Division of Chemistry and Chemical Technology of the National Research Council and received much adverse as well as commendatory criticism. Its sponsors were not to be disheartened, however, and second and third volumes have been published.

The third volume, like its predecessor, is an improvement, a job well done. The editorial board has outlined a policy of varying the subjects covered; those less active are treated every few years. Different authors have prepared the reviews, a commendable plan, which gives the reader the opinion of various authorities.

In particular, the chapters on "Sugar Chemistry" by Claude S. Hudson and "Foods" by F. C. Blanck should give the research chemist many valuable suggestions and ideas.

JAMES A. LEE.

* * *

SUGAR, MEMORANDA PREPARED FOR THE ECONOMIC COMMITTEE, League of Nations, Geneva, Switzerland. Comprises 51 pages. American Agents, World Peace Foundation, 40 Mount Vernon Street, Boston, Price 60c.

IN OCTOBER, 1928, the Economic Committee of the League of Nations authorized certain experts of world-wide reputation in connection with sugar to study the then existent crisis in that commodity. In December of that year the memoranda were completed, the printed text including statistics as of April, 1929.

The production of cane sugar is discussed by Dr. H. C. Prinsen Geerligs, of Amsterdam; the production of beet sugar by Messrs. F. O. Licht, of Magdeburg; the influence of legislation on the production, consumption, import and export of sugar, the development of sugar consumption and possibility of increasing such consumption by Dr. Gustav Mikusch, of Vienna.

The first two sections feature conditions and costs of production in different countries, full statistics of the production of sugar per unit of area, prospects of increased output, and specific remedies for alleviating the present depression.

In the meorandum by Dr. Geerligs the conclusion is reached that the safe limit per capita of sugar consumption in the United States has been reached, although the rest of the world would seem to offer a continually expanding market, his suggestion being that it might well pay to direct sales effort at the black races, whose extraordinary taste for sweets is well known and whose present per capita consumption is extremely low. In this connection the consumption per head, given in detail for each country in the world, is of interest. With the exception of Australia, Hawaii and Denmark we lead the world in sugar consumption, using 49.6 kilograms per capita per annum. China foots the list with 2.2, the average for Africa being 4.2. Between these two extremes lie many interesting possibilities of increased consumption, the successful accomplishment of relatively few of which would, presumably, wipe out the present annual excess production of one and one-half million tons. R. G. GOULD.

HYDRO-EXTRACTORS: THEIR SAFE CONSTRUCTION AND EQUIPMENT. International Labor Office, Geneva, Switzerland, 1929. Distributed in U. S. by the World Peace Foundation, 40 Mount Vernon St., Boston, Mass. 102 pages. Price $1.

THE International Labor Office, an autonomous division of the League of Nations, is publishing a series of monographs, of which this is the second, on individual problems in accident prevention.

After classifying the various types of hydro-extractor the authors describe the sources of danger in some detail, following this with a discussion of centrifugal design from the standpoint of mathematics and construction. The remainder of the book is given over to some general considerations in connection with safe practice and descriptions of a number of cases. The treatment is such that the volume should be valuable not only to manufacturers and purchasers of new equipment but especially to those who contemplate buying used centrifuges.

· GOVERNMENT · PUBLICATIONS ·

Documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.

International Trade in Citrus Fruits, by Daniel J. Moriarty. Bureau of Foreign and Domestic Commerce Trade Promotion Series 77. Ten cents.

International Fairs and Expositions, by Katheryne Junkin. Bureau of Foreign and Domestic Commerce Trade Promotion Series 75. Twenty cents.

Fisheries Documents. Two documents issued by the Bureau of Fisheries as follows: Parasites of Fresh-Water Fishes, by H. S. Pratt, Economic Circular 42, five cents; and Investigation of the Physical Conditions Controlling Spawning of Oysters and the Occurrence, Distribution, and Setting of Oyster Larvae in Milford Harbor, Connecticut, by Herbert Prytherch, Document 1054. Twenty-five cents.

Tariff Information Index. General Index to Summary of Tariff Information, 1929, on the Tariff Act of 1922. Tariff Commission document. Ten cents. A general index by commodities of the elaborate surveys made by the U. S. Tariff Commission for the committees of Congress, affording a finding list for convenient reference to available date.

Effect of Sieve Motion on Screening Efficiency, by A. W. Fahrenwald and S. W. Stockdale. Bureau of Mines Serial 2933. Mimeographed. Developed primarily as a study of sieving of minerals, but significant in its conclusions as to the efficiency of types of sifting equipment applied in the food industries.

Health Departments of States and Provinces of the United States and Canada, compiled by John A. Farrell and others. U. S. Public Health Service Bulletin 184. $1.25. A résumé of the regulations under which state food agencies operate and descriptive of these official groups with outline of personnel, investigations, and administrative procedure.

Statistics for Industries and States. Pamphlet issued by Bureau of the Census giving Census of Manufactures figures for 1927. Fifteen cents. A résumé showing for each important commodity separately classified the significant statistics for each individual state.

The Freezing Temperatures of Some Fruits, Vegetables, and Cut Flowers, by R. C. Wright and George F. Taylor. U. S. Department of Agriculture Department Bulletin 1133. Data for a wide variety of commercially handled fruits, indicating conditions required for proper control of temperature in refrigeration, either with or without freezing.

Peanuts. Report of the U. S. Tariff Commission to the President. Fifteen cents. An elaborate statistical and economic review showing the factors of production, stocks, imports, costs, etc., pertinent to determination of tariff on this commodity.

Eggs and Egg Products. Report of the U. S. Tariff Commission to the President. Ten cents. An elaborate statistical and economic review showing the factors of production, stocks, imports, costs, etc., pertinent to determination of tariff on these commodities.

· SELECTED · PATENTS ·

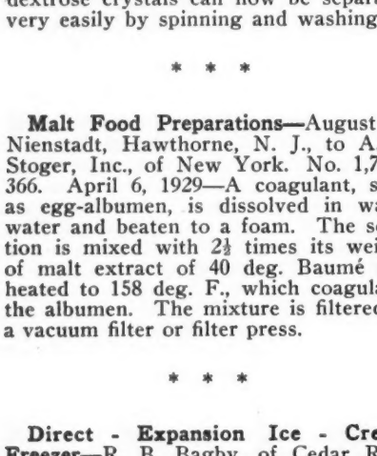
Crystallizing Dextrose—Raymond E. Daly, Homewood, Ill., to American Maize-Products Company, Roby, Ind. No. 1,708,940. April 16, 1929.—An improvement in the method of crystallizing dextrose by which crystals of uniform size are obtained that facilitate spinning and washing; this is accomplished by seeding the sugar liquor at 100 deg. F.; cooling down to 100 deg.; and allowing to stand for about 16 hours, during which time the temperature falls to from 90 to 95 deg. F. Next the temperature is raised to 110 to 120 deg. for five to eight hours to dissolve the smallest crystals, incidentally reducing the larger crystals somewhat in size. After this the temperature is reduced gradually to 90 to 95 deg. during a period of three to five hours, and held for a period of twelve hours. The dextrose crystals can now be separated very easily by spinning and washing.

* * *

Malt Food Preparations—August E. Nienstadt, Hawthorne, N. J., to A. S. Stoger, Inc., of New York. No. 1,709,366. April 6, 1929—A coagulant, such as egg-albumen, is dissolved in warm water and beaten to a foam. The solution is mixed with 2½ times its weight of malt extract of 40 deg. Baumé and heated to 158 deg. F., which coagulates the albumen. The mixture is filtered in a vacuum filter or filter press.

* * *

Direct - Expansion Ice - Cream Freezer—R. B. Bagby, of Cedar Rapids, Iowa, to Cherry-Burrell Corporation of Wilmington, Del. No. 1,709,454. April 16, 1929. A direct-expansion ice cream freezer provided with automatic pressure



control arranged so that No. 16 is set for a pressure of 15 lb. per square inch and No. 17 set for a pressure of 50 lb. per square inch. In this way any possibility of explosion due to a pressure too high for the ability of the jacket to withstand may be avoided by the safety-valve action of No. 17.

Refilled Ice Cream Cone—Daniel H. Berch, Seattle, Wash. No. 1,708,252. April 9, 1929—A formula is given for an ice cream cone which is molded and baked in the ordinary manner and the inside of the cone then sprayed with cocoa butter. The cone is then filled with soft ice cream, placed in the freezing room and frozen solid.

* * *

Removing Spray Residues—Reginald H. Robinson and Henry Hartman, of Corvallis, Ore., to the Citizens of the United States. No. 1,708,330. April 9, 1929—Spray residues are removed from the outside of fruit by washing with a dilute solution of hydrochloric acid followed by washing with a dilute solution of formaldeyde.

* * *

Peanut Butter With Yeast—Banesvar Dass, of Bloomfield, N. J., to Ellis-Foster Company, N. J. No. 1,708,914. April 9, 1929—Dried Yeast is incorporated in peanut butter to give a product containing vitamins A, B and C. The presence of the yeast tends to reduce the tendency of the peanut butter to stick to the roof of the mouth.

* * *

Improvement in Margarine Manufacture—Albert K. Epstein, of Chicago. No. 1,707,800. April 2, 1929—The manufacturer of margarine requires a period of from 18 to 24 hours for tempering the margarine after it has been chilled, the purpose of which is to bring all of the particles of margarine to the same temperature at which it is a plastic mass. According to this invention the chilled particles at a temperature of from 40 to 50 deg. F. are placed in trucks in the usual manner and drained from 15 min. to 30 min., then sprayed with warm water at a temperature of 65 deg. F. until the temperature of the margarine has been raised to about 58 or 60 deg. F. The water is then allowed to drain for 15 to 30 min. and the margarine is then worked in the usual machinery with the same facility as margarine that has been tempered for 24 hours under the older process.

* * *

Inside Labelled Bottle Closure—Ewald Goltstein, of Bonn-on-the Rhine, Germany, to Bremer Bruckman, Aktiengesellschaft, Braunschweig, Germany. No. 1,709,260. April 16, 1929—A closure for bottles provided with an internal label. The cap has a printed liner covered with a transparent coating.

* * *

The Grindrod Process of Sterilizing Milk—George Grindrod, Oconomowoc, Wis. No. 1,714,597. May 28, 1929—Whole milk is heated to 230 deg. F. for about three minutes by blowing live steam through fine orifices at the bottom of a tin-lined vessel, maintaining an external pressure by impeding the egress of the escaping steam—a heat treatment that is stated to be ample to sterilize the product. The milk is cooled by pulling a vacuum on it through a previously sterilized vacuum pan which induces evaporation that reduces the temperature very quickly, after which it is drawn into the pan, condensed, stored in bulk under an inert gas such as nitrogen. Then it is twice homogenized, cooled, kept under nitrogen, canned and sterilized.

* * *

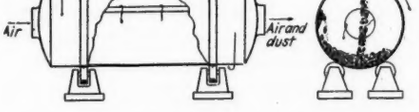
Imitation Crab Meat—Thomas S. Gorton, Jr., New York. No. 1,713,279. May 14, 1929.—A fish product can be made by combining crab or lobster meat with the flesh of other fishes that do not have pronounced flavors, and a final product is obtained which is indistinguishable from the crab or lobster. Twenty per cent crab meat, 15 per cent crab liquor and 65 per cent haddock flakes are thoroughly mixed and sterilized for 90 minutes in hermetically sealed cans.

* * *

Increasing Sucrose Content of Sugar Juice—W. H. Dickerson, East Orange, N. J. to Industrial Waste Products Corporation, Dover, Del. No. 1,713,118. May 14, 1929.—An exceedingly interesting patent in which it is found that by spray drying sugar juices the invert sugar seems to lose a molecule of water and becomes sucrose. The sugar juice is filtered free of mechanical dirt and spray dried with initial temperature over 212 deg. F., followed by immediate cooling of the powder. The sucrose content may be increased as much as 5 per cent. The ratio between invert sugars and sucrose in molasses may be increased in this manner.

* * *

Method for Conditioning Beans—John H. McFarland, of Merrill, Mich., one-fourth to Frank B. Walcott, of Wheeler, Mich. No. 1,707,360. April 2, 1929—A method by which beans may be cleaned of dirt and dust and polished. Frosted beans, having a yellowish color,



may be made white, as well as water-soaked beans, and wrinkled beans are made smooth. The beans are revolved in a tumbling barrel, with some polishing material such as sawdust, cornmeal, and the like, simultaneously blowing a stream of air through the barrel. At atmospheric temperatures the current of air merely blows out the dust while at temperatures from 65 to 150 deg. C. the heat bleaches or whitens the beans.

* * *

Milk Bottle Holder—C. M. Cowan and D. S. Minniear, Sidney, Ohio, to Miami Manufacturing Company, Ltd., Sidney, Ohio. No. 1,712,468. May 7, 1929.—A milk bottle holder, presumably for customer use, in which it is impossible to extract a delivered filled bottle of milk unless an empty bottle is put in the companion receptacle. The object is to prevent loss of milk bottles.

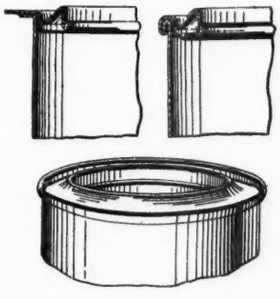
Refrigerator Car—D. F. Smith, Washington, D. C. No. 1,712,905. May 14, 1929.—An ammonia cooled refrigerator car in which the power is supplied either by storage batteries or from the axles of the car, containing a feature that will conserve the water used for cooling the ammonia condenser.

* * *

Yeast Product Containing Vitamin B—Richard Willstätter, Munich, Germany, and Harry Sobotka, New York, N. Y. No. 1,701,200. Feb. 5, 1929—By addition of monosaccharide sugars, glucose, or corn syrup to yeast a plasmolysis product rich in vitamin B and other physiologically active substances is obtained for use in baking and confectionery. An extension of No. 1,538,366 and 1,574,776 and similar in scope.

* * *

Tin Can with Soft Aluminum Top—Charles Forward, London, England, to A. Wander, Ltd., London. No. 1,715,161. May 28, 1929—A tin can with a



soft aluminum foil cover secured in place by a tin ring. The soft alloy cover obviates the use of a gasket. The can is opened by puncturing the foil through the circular aperture and tearing away the greater part of the foil.

* * *

Nut Cracker—C. E. Dellenbarger, Chicago, Ill., to Paul Carpenter, Glenview, Ill. No. 1,712,105. May 7, 1929.—A foot-operated nut-cracking machine which will operate on all sizes of nuts. Jaws moving in a horizontal plane squeeze the nut and crack it.

* * *

New Yeast Foods—Baylis M. Dawson, Brooklyn, N. Y., assignor to the Fleischman Company, New York. No. 1,706,564. March 26, 1929—Compressed bakers' yeast is mixed with fresh milk and the mixture spray-dried. The resulting product consists of viable yeast cells encapsulated with milk solids. No. 1,706,565 discloses a similar method for fruit juices and yeast, and No. 1,706,566 a method for malt extract and yeast.

* * *

Clear Artificial Ice — Max Eule, Bremen, Germany, to Adolf Hartmann, Bremen, Germany. No. 1,713,596. May 21, 1929—An improvement in the manufacture of artificial ice whereby a cake is formed which is clear with the exception of the central core, which may be removed by the common aspiration methods. A small amount of sodium carbonate or sodium hydrate is added to the water which facilitates the migration of the salts which are frozen out of solution so that they are not inclosed in the ice with the usual resultant opacity.

Yeast Food or Stimulant—O. R. Brown, Denver, Ind. No. 1,712,025. May 7, 1929.—A yeast food consisting of two parts of potassium nitrate and one part of each of the following: sodium chloride, calcium sulphate, magnesium sulphate, and calcium phosphate. It is used in the proportion of 5 oz. to the barrel of flour.

* * *

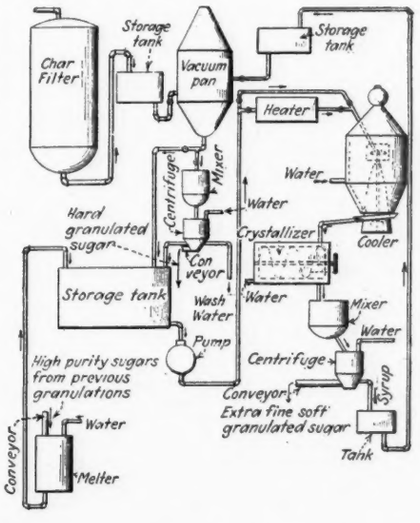
Separating Raisins from Foreign Matter—William Stoner, Fresno, Calif. No. 1,711,817. May 7, 1929—The invention depends on the fact that when two parallel revolving rollers are placed close to each other and raisins fed between them, if one of the rollers has a soft periphery and the other has a hard periphery, the raisins tend to follow the hard periphery and the stones, hard berries and other hard objects tend to follow the soft periphery. A suitable baffle underneath separates the good raisins from the refuse. Three pairs of such rollers are superimposed one above the other and perform the separating operation successively upon the rejected material.

* * *

Dehydrating Sugar Beets — B. J. Owen, Oxford, England, to Sugar Beet & Crop Driers, Ltd., London. No. 1,713,619. May 21, 1929—A process of dehydrating sliced sugar beets in layers approximately 5 to 9 in. in thickness by passing heated air at the rate of from 450 to 600 lb. of air per minute per ton of material under a pressure of 1 to 2 in. of water. The first stage of the operation requires air at a temperature between 190 and 220 deg. F.; from 220 to 250 deg. F. for the next step; and 250 to 320 deg. F. for the last step.

* * *

Process for Manufacture of Extra Fine Soft Granulated Sugar—B. H. Varnau and T. B. Wayne, Sugar Land, Texas. No. 1,715,049. May 28, 1929—The process depends on rapid cooling of sucrose solutions of sufficiently high

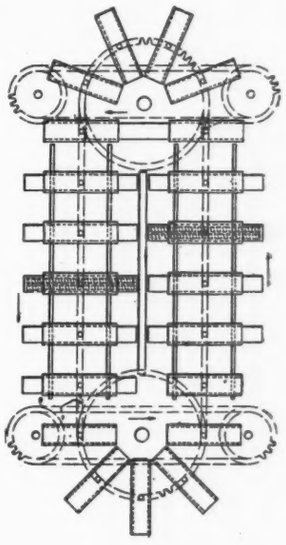


supersaturation and purity whereby it is possible to produce grain settings that are sufficiently uniform in size to allow the production of extra fine sugars of high quality. This is carried out by cooling the high purity syrup from temperatures between 140 deg. and 212 deg. F. to temperatures between 95 and 130 deg. F., giving a concentration of about 75 to 85 deg. brix.

Drying Apparatus and Method—Lucien Buck, North Adams, Mass., assignor of one-half to James Hunter Machine Company, North Adams, Mass. No. 1,703,291. Feb. 26, 1929—A modified tunnel drier with counter current air flow and progressive heating. A series of motor controlled dampers forces the air to travel spirally along the drier from the end where the articles emerge dry, to the end where they enter damp. External heaters, through which a portion or all of the air is passed, maintain its temperature and moisture-carrying power.

* * *

Vertical Traveling Electric Oven—J. E. Pointon, London, England, to Baker Perkins Company, New York. No. 1,714,815. May 28, 1929—A vertical oven having an endless conveyor



that carries both the goods to be baked and the heating elements. Goods are introduced on horizontal trays at the bottom of the vertical ascent and, at a point near the top where the trays start to pass around the sprocket, the trays, together with the electrical unit, are shifted horizontally to the descending side. The electrical heating units are so arranged that heat may be applied to top or bottom of pans, or both. Electrical contact is made by means of traveling brushes.

* * *

Deep Fat Cooker—Stanley S. Jenkins, Buffalo, N. Y. No. 1,706,491. Mar. 26, 1929—Foods such as meat, eggs, cheese, fruits, etc. are impaled on a short stick, immersed in batter and deep fried in vegetable oil at 390 degrees F. The receptacle has holders for the sticks so arranged that the article of food may be held near the hot fat after cooking to keep it warm.

* * *

Automatic Pasteurization Holding Tank System—Barge L. Hartz, Elyria, Ohio, assignor to Pfaudler Company, Rochester, N. Y. No. 1,702,897. February 19, 1929—A system of holding tanks controlled by a rotating manifold valve connected with a central transfer tank. A vacuum maintained on all the tanks serves to move the milk to the tank designated by the openings of the rotating manifold. The automatic con-

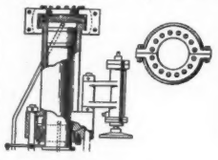
trol prevents emptying or filling a tank at the wrong time, and insures the precise holding time for each batch.

* * *

Potato and Apple Peeling Machine—Paul Borer, Delement, Switzerland. No. 1,702,992. Feb. 19, 1929—A hopper permits single potatoes to drop on to sharp pins on a rotating base plate. As the plate turns, the potato passes successive groups of flexible spring knives that peal it in segments. The knives are made to adapt themselves to the convexities of the article being peeled.

* * *

Macaroni Press—Joseph de Francisci, Brooklyn, assignor to Consolidated Macaroni Machine Corporation, New York, N. Y. No. 1,700,670. Jan. 29, 1929—Improvement on the hydraulic cylinder of macaroni presses. A yoke is provided which carries the stress of the top of the hydraulic cylinder of a macaroni press and eliminates the elongation of ordinary stud-bolts under terrific pressure and also retains the head tightly enough to preclude leakage of oil or water.



* * *

Oil Tight Can Closure—Harold A. Manderson, Cincinnati, Ohio, assignor to Procter & Gamble Company, Cincinnati. No. 1,702,786. Feb. 19, 1929—A cellulose hydrate gasket is seamed into the top of the can which is provided with a friction lid. The can is filled from the bottom side and the bottom seamed in. Thus the gasket is not disturbed till the can is opened by the consumer.

* * *

Keyless - Tearing - Strip Container—John M. Young, Brooklyn, N. Y., assignor to American Can Company, New York. No. 1,704,234. March 5, 1929—A can with the lid removable by a tearing strip that requires no key and which is so formed as to prevent injury to the thumb when opening the can.

* * *

Sausage Twisting Machine—Charles H. Allen, Pittsburgh, Pa., and Jolly L. Morris, Crafton, Pa., assignors to Packers Specialty Company, Pittsburgh, Pa. No. 1,701,713. Feb. 12, 1929—A stuffed casing, carried by a conveyor, is grasped by cam-rail actuated jaws that pinch it into links. The links are grasped by clamps and gear operated twisting elements which twist successive links in opposite directions so that untwisting is prevented. No. 1,701,712 is a variation in construction.

* * *

Sodium Aluminate Neutralizer for Corn Syrup—Clarence H. Christman, Chicago, Ill., assignor, by mesne assignments, to National Aluminate Corporation, Chicago. No. 1,692,817. Nov. 27, 1928—A mixture of sodium aluminate and sodium carbonate is used to neutralize starch conversion liquors. The neutralizer is added in sufficient quantity to bring the pH to 3.8-4.5, the "isoelectric point" of the impurities in the liquor. The theory is that the aluminum hydroxide formed acts mechanically to carry down the colloidal impurities.

Carton Liner Machine—Harley R. Phillips, Oak Park, Ill., assignor to Mojonnier Brothers Company, Chicago. No. 1,702,704. Feb. 19, 1929—A machine to make parchment paper liners for cartons such as are used for brick ice cream. A revolving vertical shaft with four equally spaced arms moves in 90-degree steps. A liner is formed each revolution: (1) An arm removes paper from the feeding mechanism, (2) the paper is folder into liner form, (3) the operator slips the carton over the liner, (4) the open ends of the carton and liner are folded back ready for filling and the carton is discharged off the arm.

* * *

Can Capper—Rudolf Stroppel, Cedar Rapids, Iowa; George Stroppel administrator of Rudolf Stroppel, deceased. No. 1,704,227. March 5, 1929—A can capper, adjustable to various heights and sizes of cans, in which the cans move through the machine in a straight line. All parts are open and accessible and adjustments to extreme sizes are easily made.

* * *

Prevention of Blue Mold on Citrus Fruit—William R. Barger, Pasadena, Calif., assignor to the Government and the People of the United States. No. 1,704,072. March 5, 1929—Citrus fruit is soaked for three to ten minutes in a 0.25-2 per cent solution of cadmium sulphate (3 $CdSO_4.8H_2O$) to prevent decay due to infection by blue and green molds. No. 1,704,073 specifies cadmium chloride ($CdCl_2.2H_2O$) and No. 1,704,456 a mixture of the chloride and sulphate, both used in the same way as the sulphate alone.

* * *

Noodle Folding Machine—Carmine Surico and Paul Cardone, New York, N. Y., assignors to Clermont Machine Company, Inc., New York. No. 1,706,637. March 26, 1929—Noodle dough, cut into strips, falls onto the first of a series of three endless belts and passes from one to the other over the end pulleys. By the use of cams the belts can be given a transverse or longitudinal motion in various orders and combinations. Each change of direction of motion of the belts makes a fold in the noodle. An almost endless variety of folding can be made by using cams of different shapes.

* * *

Yeast Cake Forming and Wrapping Machine—E. L. Smith and H. J. Paynter, Springfield, Mass., assignors to Package Machinery Corporation, Springfield, Mass. No. 1,702,176. Feb. 12, 1929.—A specially designed machine to prevent crumbling of yeast while forming it into cakes and wrapping it.

* * *

Condensed Milk Can Filler—John M. McClatchie, New York, N. Y., assignor to the Borden Company, New York. No. 1,708,482. April 9, 1929—A series of oscillatory, sector-shaped pumps of one-can capacity are mounted on a common shaft and oscillated by the same crank. Both halves of the pump receive milk from a common manifold and while one side is filling the other side is being emptied into cans. The cans are brought to the machine empty and taken away filled by the same conveyor. Laterally moving arms, actuated by the pump shaft, move empty cans from the conveyor onto the filling tables. The return motion moves the filled cans back onto the conveyor to be removed. While being filled the cans are rotated. Hence, owing to centrifugal force, they are filled from the wall to the center and all air bubbles are squeezed out.

* * *

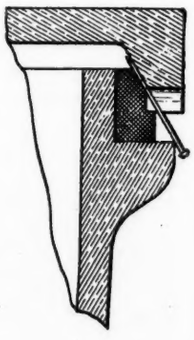
Purification of Oils—Henry Odeen, Palo Alto, Calif. No. 1,705,825. March 19, 1929—Crude vegetable or animal oils are refined by a dry process with less expense than by wet methods. A small amount of water (depending on the free fatty acid content) is added to the oil. It is then treated with a "dry chemical" made from strong caustic soda solution, dried on some absorbent such as fullers earth. The amount of "dry chemical" added is sufficient to neutralize the free fatty acid and to absorb all the water in the oil. A sludge of impurities and absorbent material settles out in one-half to one hour and the refined oil above is filtered.

* * *

Malted Milk Bars—Shirley A. McDougall, Indianapolis, Ind., assignor to Dextora Company, Indianapolis, Ind. No. 1,705,332. March 12, 1929—A dough, of malted milk, sugar and water, is rolled into sheets and cut into bars which are dried in a vacuum oven.

* * *

Outside Sealed Vacuum Jar—Gray Staunton, New Haven, Conn., assignor to Vacuum Seal Co., New York. No. 1,700,957. Feb. 5, 1929 — A vacuum jar, illustrated in the cut, shows a pin being inserted in the manner in which the vacuum is broken and the jar opened.



* * *

Cereal Food and Process of Preparing—Wallace D. Smith and Boneita A. Smith, Kalamazoo, Mich. No. 1,705,034. March 12, 1929—Wheat grains are heated with water and steam under pressure until the starch is gelatinized. Water is added to the grains to swell them and the excess removed by a centrifuge. The wet, swollen grains are immersed in a vegetable oil, such as coconut, at 400 deg. F., until cooked. The excess oil is removed by a centrifuge. The finished product may be used as a breakfast food or in confectionery.

* * *

Meat Skinning Machine—Martin Andrew Watson, Chicago, Ill., assignor to Swift & Company, Chicago, Ill. No. 1,793,217. Feb. 26, 1929—A device for removing the skin from slabs of meat such as bacon. The slabs are pushed into the machine by corrugated rolls which force them against the skinning knife. The knife consists of a sharp flexible steel belt mounted much in the manner of a bandsaw.

· PRACTICAL · OPERATING · DETAILS ·

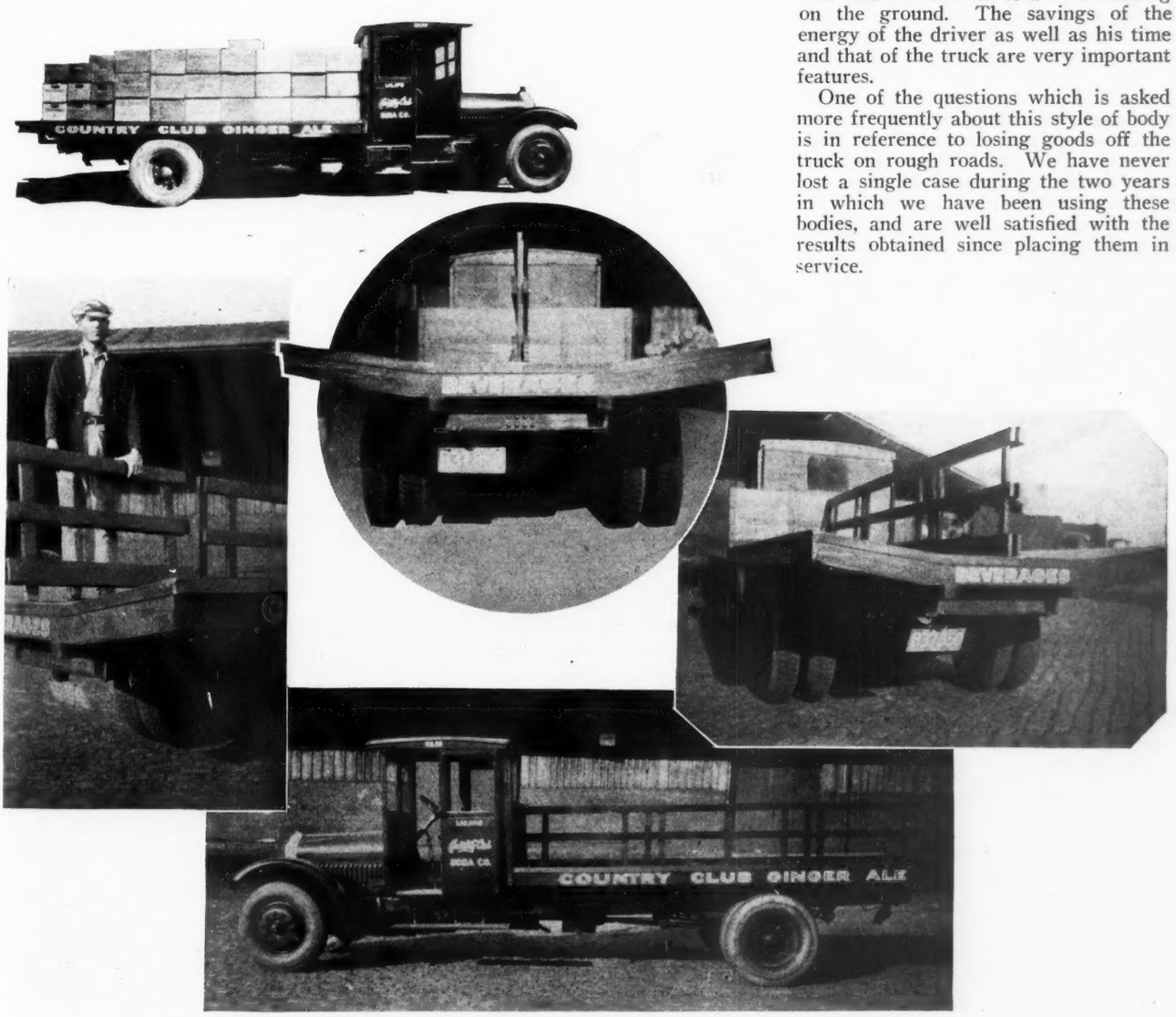
A Truck Body That Saves Time and Energy

By W. J. EGAN
Superintendent Country Club Soda Company
Springfield, Mass.

THE carbonated beverage industry has a materials handling problem that has no exact parallel in any of the other fields of food manufacture. This is the problem involved in the delivery of goods. When stake-body trucks are used, the driver has to climb to the top of the load at every stop and, to our way of thinking, there are not sufficient profits in the beverage business to permit paying a man for climbing up and down a heavily loaded truck.

We have found that the solution of this problem has been the design of a new type of truck body with a sort of fence in the middle. The sides of the bed are sloped upward and the cases of goods are tilted toward the "fence". The benefits of this arrangement are so apparent that it hardly seems worth while to mention the fact that any part of a load is accessible to a man standing on the ground. The savings of the energy of the driver as well as his time and that of the truck are very important features.

One of the questions which is asked more frequently about this style of body is in reference to losing goods off the truck on rough roads. We have never lost a single case during the two years in which we have been using these bodies, and are well satisfied with the results obtained since placing them in service.



MANUFACTURERS' · NEWS · AND · EQUIPMENT

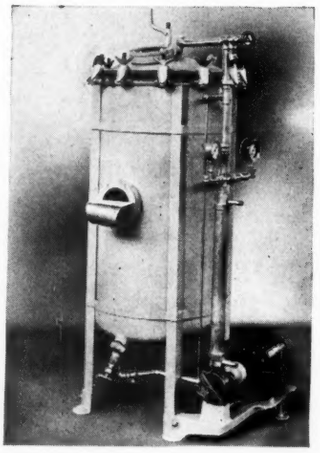
Glass-Lined Percolator

A NEW 50-gal. percolator, recently introduced by the Pfaudler Company, of Rochester, N. Y., is known as the "Pre-Vak, Jr." This is a redesign of a 60-gal. percolator which sold at more than double the price of the new one.

The new percolator consists of a glass-lined receptacle provided with a pressure-tight cover which is capable of being swung away from the body of the percolator on a pivoted arm. Material to be treated is placed in a metal basket with a perforated bottom which is suspended within the receptacle so that a pressure-tight joint is formed between the regions above and below the basket. A circulating system withdraws the extracting liquid from the bottom of the receptacle, passes it through a rotary pump and up through a pipe, which may or may not be provided with a steam jacket for heating, and then to a spray located in the cover of the percolator.

Sight glasses are set into the cover and side of the percolator. Other features include a mounting for the pump motor attached directly to the apparatus, a relief valve for bypassing the menstruum in case of overpressure and a three-way valve mounted in the circulating line for discharge of the extract from the percolator to storage.

The machine is intended for making extracts, such as vanilla, or for performing pharmaceutical percolations. In operation the material to be extracted is sprayed with the extraction liquid while the region above the basket is under a pressure of about 8 lb. This combined with a vacuum maintained at about 4 in. beneath the basket causes the liquid to pass rapidly through the material. Menstruum may be either heated or run cool as required.



New 50-gal. Pfaudler Percolator Operating on Pressure-Vacuum System

Manufacturers' Latest Publications

Unless stated otherwise in the text, free copies of these publications may be obtained from the manufacturer by readers of FOOD INDUSTRIES *who mention our journal in connection with their request.*

Ozone. U. S. Ozone Company of America, Scottdale, Pa.—Technical Publication No. 10. A concise treatise on the principles, design and action of ozone and electrolytic water purifying apparatus.

Gas Boosters. Connersville Blower Company, Connersville, Ind.—Bulletin 233, describing Victor gas boosters for pumping gas for gas-burning furnaces and ovens.

Baffles. Combustion Engineering Corporation, New York—May issue of *The Safety Valve*. Reprint of article on baffling for straight-tube boilers.

Ultra-violet Lamps. Cooper Hewitt Electric Company, Hoboken, N. J. — Engineering department Bulletin 105-B, entitled "Uviarc Lamps and the Ultra-violet," giving quantitative technical data on the production and uses of ultra-violet rays. Engineering Department Bulletin 104-B describes "Lab-Arc" monochromatic light and its uses.

Colloid Mills. Travis Colloid Research Company, Inc., 119 Broad St., New York City—Circular describing the use, application and specifications for Hurrell colloid mills in homogenization, emulsification and dispersion.

Electrical Equipment. Lincoln Electric Company, Cleveland, Ohio—Circular G7, describing across-the-line safety starters.

Lubrication. Alemite Manufacturing Corporation, 2676 North Crawford Ave., Chicago—June issue of *Alemite Industrial Lubrication* contains information regarding this type of lubrication.

Boilers. Erie City Iron Works, Erie, Pa. — Bulletin describing the use of powdered coal for the horizontal tubular boiler.

Detergent. Oakite Products, Inc., 22 Thames St., New York City—Booklet 1741, describing the use of Oakite for cleaning purposes in the food industries.

Refrigerator Truck Bodies. William S. Baird Company, Winchester, Mass.—Catalog describing Baird refrigerator bodies which are built with four distinct types of refrigeration, namely, ice and salt; frozen brine, iceless; solid carbon dioxide; and mechanical.

Packaging Machinery. J. L. Ferguson Company, Joliet, Ill.—Booklet illustrating automatic filling machines, carton sealers, carton formers, automatic scales, etc., and typical installations.

Sifter. Great Western Manufacturing Company, Leavenworth, Kan.—Catalog No. 60. Description of the Great Western, balanced, controllable sifter with illustrations and diagrams. The sifter is a gyratory type. Dimensions and prices given.

Candy-making Machinery. J. W. Greer Company, 119-137 Windsor Street, Cambridge, Mass.—A series of leaflets. D, chocolate coating unit; consisting of automatic feeder, bottomer, coater, cooler, and packing table. F, chocolate melting kettles. G, candy crystallizing machine. H, chocolate coater. I, cooling tunnel.

Canning Machinery. Hansen Canning Machinery Corporation, 84-90 Hamilton Street, Cedarburg, Wis.—Profusely illustrated catalog describing can washers, can filling machines for peas, beans, kraut, corn, tomatoes, etc.; beet toppers; and conveyors.

Cold Storage Doors. Jamison Cold Storage Door Company, Hagerstown, Md.—A seventy-page catalog, profusely illustrated with photographs and blueprints. Cold storage room doors of all kinds are minutely described and specifications and working drawing are given.

Conveyors. Logan Company, Louisville, Ky.—A book of 112 pages giving many illustrations of Logan Conveyor installations. Gravity roller, moving roller, roller spirals, chute spirals, apron, bucket, belt and screw conveyors, and many other types are illustrated. Photographs of systems in several food plants are included.

Electrical Equipment. General Electric Company, Schenectady—GEA-1106. Type CR 7006-71 magnetic switch for starting induction motors on line voltage. GEA-517. Type CD direct current motors, totally inclosed and fan-cooled, 2 to 51 hp. are described. GEA-98A describes ¾ to 2 hp. A.C. motors with brush-shifting, 2½:1 speed adjustment.

Century Electric Company, 1806 Pine St., Saint Louis,—Bulletin No. 17-6 on 16-in. ventilating fan. Bulletin No. 14-1000 describes portable A.C. motors of 3, 5 and 7½ hp. mounted with switch on a two-wheeled truck.

Refrigerator Truck Bodies. William F. Baird Company, 1017 Main Street, Winchester, Mass.—Description and illustration of truck bodies equipped for four types of refrigeration: ice and salt, frozen brine, solid CO_2, and mechanical. Capacities are also given.

Glassine Paper. The Warren Manufacturing Company 342 Madison Avenue, New York.—A folder containing eight samples of glassine paper, plain and waxed, with suggestions for their use.

Wire and Figured Glass. The Mississippi Glass Company, 220 Fifth Avenue, New York—A beautifully illustrated catalog, which describes figure and wire glass with specifications and illustrations of each type and suggestions for its use.

· NEWS · ITEMS ·

Fleischmann and Royal Baking Powder In Big Food Merger

THE much-discussed merger centering around the interest of J. P. Morgan & Company, New York bankers, in the Fleischmann Company, a development that has been under consideration for several years, assumed definite form with the recent announcement of the formation of a holding company—as yet unnamed—the initial properties of which are to be Fleischmann, Royal Baking Powder, and the E. W. Gillett Company, Ltd., Royal's Canadian subsidiary.

Joseph Wilshire, president of the Fleischmann Company, is scheduled to head the combined companies. Donald K. Davis, executive vice-president of the Royal Baking Powder Company, has been named vice-president. In addition to the foregoing, the directors of the newly formed concern will include Max C. Fleischmann; William Ziegler, Jr., now president of the Royal company; William Ewing and Henry P. Davison, of the Morgan interests.

It is reported that the bankers were from the outset favorably impressed by the efficient working of the far-flung distributing organization of the Fleischmann Company. This in addition to its recognized pre-eminence in the manufacture of compressed yeast, vinegar, other food products and industrial alcohol.

That J. P. Morgan & Company has been buying heavily of Fleischmann Company stock is well known, some reports having been to the effect that Mr. Fleischmann had practically disposed of his holding to the banking house. The inclusion of two Morgan men in the board of directors of the new company is regarded as an indication of the extent to which such stock transfers have been made.

Royal brings to the merger a long and successful career in the manufacture and sale of baking powder, starch and its products, mayonnaise, jelly powder, and other items, both in this country and in Canada, as it owns a majority of the capital stock of E. W. Gillett Company, Ltd., Toronto, the largest Canadian baking powder company.

Should all shareholders of the companies exercise their option of exchange for shares of the new holding company, about 12,500,000 shares would be issued. On the basis of their present market value they would represent nearly $430,000,000.

The new company will have authorized the following share capital:

One million shares of cumulative preferred stock without par value, each issued share of which will be entitled to one vote. The series to be issued in connection with the plan will carry dividends at the rate of $7 per share a year.

Twenty million shares of common stock without par value, all of one class, each issued share of which will be entitled to one vote.

The new company will offer to acquire, on the basis and conditions set forth in the plan, either all or substantially all of the assets or the stock of the Fleischmann Company, Royal Baking Powder Company and E. W. Gillett Company, Ltd.

Stockholders of the three companies who participate in the plan will receive shares of stock of the new company on the following basis, in case the plan is consummated:

Two and one-half shares of common stock of the new company for each share of common stock of the Fleischmann Company.

One share of cumulative preferred stock, Series A, or, at the option of the depositor as provided in the plan, four shares of common stock of the new company for each share of the present preferred stock of the Fleischmann Company.

One share of common stock of the new company for each share of common stock of Royal Baking Powder Company.

One share of cumulative preferred stock, Series A, for each share of preferred stock of Royal Baking Powder Company.

Ten shares of common stock of the new company for each share of common stock of E. W. Gillett Company, Ltd.

The outstanding share capital of the two companies, together with the market value of their shares is shown in the following table:

	No. of Shares	Aggregate Market Value
FLEISCHMANN COMPANY		
Common stock	4,500,000	$389,250,000
Preferred stock	12,220	1,515,280
ROYAL BAKING POWDER		
Common stock	800,000	$28,000,000
Preferred stock	100,000	10,700,000
Total		$429,465,280

Neither the Fleischmann Company nor Royal Baking Powder has any funded debt.

According to the bankers' announcement there is soon to be added to the group Chase & Sanborn Company, the well-known New England coffee, tea, and spice house.

Reading between the lines of the announcement the financial district assumes that other related food-product concerns will be brought into the affiliation. For some time there has been persistent rumor that Postum Company, Inc., would be a part of the merger, but so far the report lacks substance. There has been mention also of the Kraft-Phenix Cheese Corporation, the Gold Dust Corporation, Campbell Soup Company and other corporations.

Following the announcement of the amalgamation, Senator King of Utah stated in the Senate that in his opinion the Attorney General should take prompt action to enforce the anti-trust laws lest monopoly and consequent price raising result. He asserted that both the Sherman anti-trust law and the Clayton Act, as well as similar statutes in most of the states, were at present being enforced by neither federal nor state officers.

COMING EVENTS

AUGUST

17—Missouri-Illinois District Association of Operative Millers, St. Louis.

SEPTEMBER

7—Texas-Oklahoma Association of Operative Millers, Fort Worth.
9-13—American Chemical Society, Minneapolis.
25-27—Pennsylvania Millers State Association, Harrisburg.
American Bakers Association, Annual Convention, Chicago.

OCTOBER

8-10—Wisconsin Buttermakers Association, Chippewa Falls, Wis.
12-19—National Dairy Exposition, (Dairy Cattle), St. Louis.
21-23—International Association of Ice Cream Manufacturers, Toronto.
21-26—Dairy Industries Exposition, Toronto.
24-26—International Association of Milk Dealers, Toronto.
28-30—Annual Convention, Mayonnaise Products Manufacturers Association of America, Atlantic City.

Loft-Curtiss Merger Under Way

Negotiations are under way for the acquisition of the Curtiss Candy Company, of Chicago, makers of the Baby Ruth candy bar, by Loft, Inc., of New York. The Baby Ruth bars will be made at the Long Island City plant of Loft, and the Curtiss distribution organization will handle Loft's products. Loft also will open a chain of restaurants in its New York stores.

Farm Board Not Likely to Disturb Present Food Manufacturing

Expected to Foster Co-operation Between Food Industries and the Farmer—Senate to Lower Suggested Rates—Needs of Rice Industry Told—Smoot Tackles Cigarettes

By Paul Wooton
Washington Correspondent

As all the world knows, the administration's farm relief measure—minus the debenture feature—was recently passed by both houses and signed by President Hoover. This new farm law is to be administered by a federal farm board of eight, with a $500,000,000 revolving fund to be used in assisting farmers and their co-operative organizations in orderly marketing.

In the supreme effort the federal government is about to exert in the interest of agriculture there is no reason to believe that farmers or their co-operative organizations will be encouraged to go into manufacture. Such forays as the farmer has made into the fields of manufacturing and of distribution have been conspicuously unsuccessful, with the exception of those enterprises where the element of freshness is of sufficient importance to justify community manufacture or processing.

Doubtless the new Farm Board will encourage and will be ready to give financial backing to the small creamery, cannery or cold storage plant. One of the main objectives of the Farm Board is expected to be the elimination of waste in the handling of agricultural products.

Neither the farmer nor his co-operative association is at all ambitious to infringe upon the field of private enterprise in manufacture. Were any such tendency to manifest itself this administration could be relied upon to discourage it. The Farm Board, however, may be expected to exert the full weight of its influence to bring about more sympathetic and closer co-operation between the food industries and the farmer. Specialists here, who doubtless will be called upon for a large amount of work for the new board, regard the encouragement of this type of co-operation as one of the very important things which the board can do.

Farm Feels Need of Electricity

It is fully expected that rural electrification will be stimulated in every way within the power of the Farm Board. It is recognized that the unavailability of electricity on the farm has been one of the drawbacks to the elimination of waste and the setting up of many other economies. If the small farmer had a large refrigerator and if those operating on a somewhat larger scale had a refrigerated room, a large amount of waste, now unavoidable, could be prevented.

After 30 years of experience, agricultural specialists are practically a unit in recommending the co-operative creamery. Butter made on the farm is a high-cost product and frequently of poor quality. The nearby creamery, however, is in a position to make "premium" butter and make milk production a profitable source of income on the average farm. It has been found to be more profitable to bring the churn to the cream than to attempt to sacrifice freshness by shipping it to a larger plant at a greater distance from the source of supply.

At the small creamery the operator is in close touch with the individual farmer and is in a position to give him valuable advice as to the attaining of a maximum output of clean fresh milk. The board's policy is expected to encourage small community processing plants, such as those to sand eggs and to provide facilities for giving them an oil bath so that this product can be put into marketing channels in accordance with the best practice.

In the citrus fruit region the great promise of new processes for the shipping of juice and the freezing of the prepared fruit is expected to result in the development of small community plants, but the farmers themselves will not be encouraged to undertake canning in a large way.

Savings in Co-operation

The principal function of the board will be to point the way and to set up practices which the farmer should follow if he is to reduce his activities to the most business-like basis. If the board can get the producer and the manufacturer of food industries to co-operate closely it is believed that great savings can be effected. The entry of the farmer into distribution will be discouraged. It is felt that he should stay with production but that fair arrangements should be worked out with distributors and with large consumers of his products. It is said that the present tendency is much more for distributors and manufacturers to go into production than for the farmer to undertake the highly specialized job of distribution, or to undertake to find the capital and the technical skill necessary to enter upon manufacture in a large way.

An expansion of the policy of the sugar manufacturers of contracting in advance at minimum prices for needed raw material is expected to develop as one of the policies of the Farm Board. It is believed that there are several agricultural lines in which this plan can be adopted with much advantage of both the manufacturer and the producer.

Certain rates on foodstuffs in the tariff bill as first reported were given in last month's issue. The following list gives changes that were made subsequently and before the bill went over to the Senate. Duties are in cents per pound unless ad valorem is indicated by the percentage given.

1. Live stock and meats: cattle, 2½
2. Dairy products: dried buttermilk, 2½; butter and oleomargarine, 14.
5. Fruits: figs, dried, fresh, or in brine, 5; preserved figs, 40 per cent.
6. Vegetables: onions, 2; tomatoes, prepared or preserved, 40 per cent.
7. Nuts: shelled peanuts, 7.
10. Chocolate or cocoa: unsweetened, 3; sweetened or prepared, 40 per cent; cocoa butter, 25 per cent.

In paragraph 502, the provision for molasses to be commercially used for distilling purposes, put by the Ways and Means Committee at 0.36c. per pound of total sugars, is stricken out. This reduces the alcohol blackstrap duty to the basic duty on non-edible molasses.

Revision Downward Likely

Although it has become apparent that the only changes the Senate is likely to make in the pending tariff bill will be downward revisions, there is every reason to believe that as a result the agricultural and food sections will be accorded far more lenient treatment. It is pointed out, in the first place, that the majority of one vote by which the Senate prevented the bill from being limited to consideration of farm products is a clear indication that the upper body of Congress desires to place primary emphasis on the agrarian situation. It is asserted also by agricultural interests that their needs are relatively more urgent because of the progress in the food industries, which have lifted their products from a domestic to a world basis.

During the progress of the hearings of the Senate Finance Committee's subcommittee on agricultural products up to the time of this writing the bulk of the testimony has been confined to tomatoes. Representatives of tomato producers of Texas and Florida announced that they are satisfied with the 3c. rate on fresh tomatoes provided in the Hawley bill and directed their arguments to induce the committee to leave these rates as they are. Metropolitan produce dealers, on the other hand, pointed out that there is no appreciable domestic production during the winter months, which is the only time of the year that foreign tomatoes are brought in. Those interested in other commodities, however, represented to the committee that the rates provided in the House bill are insufficient. These commodities include figs, cherries, milk, butter, and cheese.

Although Southern tomato producers are contented with the 3c. rate on fresh tomatoes, canners from Indiana and Maryland, reinforced by Senators and Representatives from these states, asked for an increase to 60 per cent ad valorem

on canned tomatoes and tomato products. Senator Townsend, of Delaware, also made an appeal for the 60 per cent duty. The rate in the Hawley bill is 40 per cent. Due to the present low tariff, tomatoes are rotting on the ground in New Jersey, Senator Kean, of New Jersey, stated.

Appearing as a representative of the Tri-State Packers' Association, Franklin Shook, of Easton, Md., testified that 181 of 500 canners of tomatoes did not make a profit on that product and have had to go out of business, due to the competition of imported canned tomatoes. Mr. Shook expressed the opinion that it seems curious that this country, which produces enough canned tomatoes to supply the world trade, should at the same time be subjected to foreign competition. A rate of 60 per cent would not keep all tomato products out of the country but would enable domestic canners to compete successfully with foreign producers, it was brought out.

Opposition to the increase from 2 to 5c. a pound on dried figs in the House bill was expressed by Dr. Clarke E. Davis, of New York, representing the National Biscuit Company. Not only are California figs lacking in the flavor necessary for biscuit making but the diseases to which they are subject make it seem certain that the biscuit makers will have to stop using figs if prohibitive duties are assessed on importations from Turkey, Dr. Davis declared. In answer to questions by committee members, he said that the increase in the cost of figs would be reflected in increased prices to the public. The California fig, which he characterized as the only domestic fig approaching the Turkish product, is of inferior flavor due to soil and climatic conditions, he said. In response to questions by Senator Shortridge, of California, he stated that it would seem to be up to the Department of Agriculture rather than food manufacturers to ascertain what peculiar qualities of the soil of Turkey and Smyrna produce the flavor of their figs. Senator Shortridge expressed confidence that the California growers soon will overcome the disease that threatens their product and will be in a position to satisfy the needs of the manufacturers.

Where Italian Tomatoes Go

Louis J. Scaramelli, representing Mattia Locatilli, of New York, told the committee that Italian tomatoes are non-competitive with the American product and that their entry into this country is chiefly for the purpose of supplying persons of Italian ancestry. He said that he imported Italian tomatoes and tomato paste and that he spoke for the Food Merchants' Protective Association of New York. Production costs under the present conditions in Italy will not permit the paying of 40 per cent ad valorem, he declared. As to cheeses, he said that the tariff proposed in the Hawley bill penalizes the Italian producer because his product is non-competitive. He expressed the belief that this section of the bill is aimed at Swiss cheeses but makes the classification general so as not to offend a particular country by singling it out.

As oils and fats can trace their origin back to the farm it is possible that the Senate Finance Committee will attempt to increase somewhat tariff rates thereon. Representatives of farm organizations renewed their request for a flat rate of 45 per cent ad valorem or its specific equivalents on all vegetable and animal oils and fats. Doubtless more will be heard on this proposal when the free list is taken up. Segregation into one schedule of oils and fats now in Schedules 1 and 7 was suggested.

The proposal advanced by the soap industry for the duty-free importation of oils when rendered unfit for human consumption by denaturing was opposed by Vincente Villamin, New York City, representing Philippine interests, who declared that this would destroy Philippine exports of coconut oil to the United States. Ed. Woodall, of Dallas, representing the Texas and Oklahoma Cottonseed Crushers' Association, countered with a demand for a duty to be levied on coconut and palm kernel oil imported from the Philippines.

Oil Has Its Triangle

The testimony with respect to olive oil presented the usual triangular picture. J. J. Hoey, San Francisco, representing the California Olive Association, asked for an increase in the duty on loose edible oil from 6½ to 10c. per pound, asserting that the canned olive business must now absorb the losses sustained on the 40 per cent of the California crop that is converted into oil. R. U. Delapenha, of New York, representing the packers of olive oil, declared that they could not exist under a differential of only 2c. between the duties on loose and canned oils, and recommended 3c. The House bill carries the present rate of 6½c. per pound on loose oil and increases the duty on canned oil from 7½ to 8½c. E. L. Sozzi, New York, representing importers of canned olive oil, asked for the same rate on canned as on loose oil. A specific duty of 4c. and not more than 5c. per pound on all imported oils and fats in bulk, plus a differential of 3c. per pound on packaged oils, was requested by Nathan Musher, of Baltimore, representing the Van Camp Packing Corporation.

Contending that there should be no differential in the duties on loose and canned olive oil, H. W. Redfield, of Mendham, N. J., representing canned-oil importers, declared that in the past five years only three shipments of imported loose oil have been found on government inspection to be adulterated while, during the same period, there have been brought under the Food and Drugs Act 175 cases of adulteration or misbranding of imported oil canned in this country. A duty on bulk olive oil no higher than 4c. per pound, with a reduction in the differential on canned oil, was urged by Louis J. Scaramelli, representing the Food Merchants Protective Association of New York.

S. M. Archer, of Minneapolis, representing the Linseed Crushers Tariff Committee, asked for a duty of 5c. per pound on linseed oil, arguing that the differential over flaxseed must be maintained.

Camillo Osias, Resident Commissioner of the Philippine Islands, declared that the proposal of the farm organizations for a duty on Philippine coconut oil would cripple Philippine purchasing power for American cotton cloth.

J. L. Dirick, of Baltimore, representing the Oil Seeds Crushing Corporation, opposed the recommendation made to the Ways and Means Committee by the soap manufacturers to admit coconut oil free of duty, if denatured.

The increase from 1 to 1½c. per pound on arrowroot starch carried by Paragraph 85 of the House bill was opposed by Joseph Morningstar, New York importer. Mr. Morningstar informed the committee that there is no domestic production of this product.

An increase in the duty on casein will render impossible its use in the manufacture of coated paper, according to George C. Lucas, representing the National Publishers' Association, New York City. He told the committee that many publications now are shifting from the use of coated paper to super-calendared paper. Appearing as a rebuttal witness for the milk producers, Charles W. Holman, of the National Co-operative Milk Producers Federation, Washington, asserted that if the duty on casein is increased from 2½ to 8c. per pound, as proposed by the milk producers, they would guarantee the production of all the casein needed by the coated-paper manufacturers.

Rice Industry Needs Help

In connection with the debate on the tariff, Representative De Rouen presented to the House seventeen specific things the federal government could do to help the rice industry. They include tests in growing patna rice; establishment of field offices in Louisiana and Arkansas; experimentation to determine the relative value of fertilizers; experiments to develop the best methods of irrigation; experiments to determine when rice is ready for cutting and threshing; studies of methods of handling rice; studies of warehouse construction; advice as to insect, weevil, and rat control; establishment of grading offices; additional statistics; establishment of market news; experiments in processing, drying, quoting, oiling and ageing; cooking tests; market surveys in foreign countries; additional appropriations to enable existing agricultural experiment stations to do more work on rice; rice-farm management studies; continuation of price determination studies. In his presentation Mr. De Rouen urged more theoretical research as one of the great needs of the rice industry.

A controversy of many years' standing over the so-called "water glass test" of baking powders has brought a decision from the Federal Trade Commission ordering the Calumet Baking Pow-

der Company to cease using this test in demonstrations. In comparing the relative merits of powders by the water glass method, a sample of each is put in a glass and water is poured on them. The glasses fill with foam. Since Calumet powder includes a small quantity of dried albumen, the bubbles hold up while in other powders the gas soon escapes and the foam recedes. Calumet salesmen have been using this test to prove superior leavening qualities for their product.

The Commission holds, however, that experimental baking has shown no advantages due to the added albumen and that the water glass test therefore is deceptive. The decision was a close one, two or the five Commissioners dissenting from the order. Some still think that the water glass test is valid. It is considered likely that the Calumet company will endeavor to obtain a legal review of the Commission's ruling.

At the Twenty-Second National Conference on Weights and Measures at the Bureau of Standards, Washington, D. C., on June 4 to 7, numerous weighing, measuring, and metering problems were brought up for discussion. The conference is an organization composed of representatives of states, counties, cities, towns, manufacturers, and business groups interested in weights and measures regulation and has been in great part responsible for developing standard specifications and ordinances throughout the country.

Among the important features of this year's meeting were the reports of committees on tolerances and specifications for liquid measuring devices and for automatic indicating scales. Gasoline dispensing devices were the subject of several papers read during the sessions. Foodstuffs weighing and packing also were major topics.

Cheese Industry Trade Practices

A successful trade practice conference was held on June 7 in Chicago by leading cheese manufacturers. Fifty delegates representing about 90 per cent of the industry concurred in a series of resolutions encouraging sound practices and banning methods laid down as unfair competition. Among the "thou-shalt-nots" are commercial bribery, rendering false or misleading statements, and excessive trucking charges in sales. The practices recommended are: guaranteeing that cheese fill state specifications, observing grading rules, buying and selling by grade, and paying regular market prices. A proposal to stop the use of second-hand cheese boxes was defeated. Chairman E. A. McCulloch of the Federal Trade Commission presided over the session. J. D. Jones, of the National Cheese Institute, was elected secretary.

Increasing the scope of the Food and Drugs Act to include the advertisement, as well as the labeling, of food and drug products under government supervision is proposed in an amendment offered to the law on June 10 by Senator Smoot, Republican, of Utah. Senator Smoot's bill (S. 1468) also would bring tobacco and tobacco products under the control of the Food and Drugs Act. The bill was referred to the Senate Committee on Agriculture after its sponsor, in an address on the floor, declared that its purpose is to curb the abuse of tobacco and to protect the public health and public welfare from further exploitation by irresponsible cigarette interests.

At present the Federal Trade Commission co-operates with the Food, Drug and Insecticide Administration in an effort to prevent false and misleading advertising, but Senator Smoot stated that as the Commission has no laboratory facilities and no adequate corps of investigators, procedure is unduly slow. In matters affecting public health, he declared, vast harm may be done before the Commission is ready or able to take action.

With particular reference to bringing tobacco under the provisions of the Food and Drugs Act, Senator Smoot stated that it has escaped such control only by a technicality. In Section 6 of the act, drugs are defined as "all medicines and preparations recognized in the U. S. Pharmacopœia, or National Formulary, for internal and external use." As modern medical science has abandoned the use of tobacco as a medicine, it was dropped in the last revision of the U. S. P. and consequently is not embraced by the regulations of the Food and Drugs Act.

The Forthcoming Census

Now approaching final enactment, the legislation authorizing the decennial census will provide a broader statistical evaluation of the nation's natural resources, man power, manufactures and consumption than has ever been attempted in the past. In addition to the count of the population and a census of unemployment, there will be a census of industrial production, of distribution, of agriculture and livestock, and of mining. A survey of irrigation and drainage is provided for as well.

The feature of the census is the provision for the tabulation of inter-industry, wholesale and retail sales of all manner of products. The recommendation for such a census was first made by Mr. Hoover in 1925 when, as Secretary of Commerce, he declared that the basic facts on production are available but that distribution presents a blank picture. Looking forward to the first national census of distribution the Department of Commerce has conducted several trial censuses in various cities of inter-industry, wholesale and retail business.

"Marketing and distribution are changing so rapidly," said Dr. Julius Klein, Assistant Secretary of Commerce, in commenting on the census project, "that we are in urgent need of more statistical information in order to guide these changes in constructive directions. The census will give considerable information on the volume of business by classes of commodities and it is proposed to secure more detailed information from selected dealers as to the volume of business in individual commodities and in individual lines."

During the hearing of the agricultural subcommittee on June 19 on the House tariff bill, F. H. Haserot, of Cleveland, presented a plea for more protection on cherries. He said that Paragraph 737 of the bill should be amended in such fashion as to take dried cherries out of the first section and put them in Section 3, which provides a duty of 5½c. a pound. Under section 1 a duty of 2c. a pound is levied. Further protection is necessary, he explained, because it takes 6 lb. of dried cherries to equal 1 lb. in their natural state. He also asked that the words, "or frozen," be added to the paragraph to protect against the importation of frozen cherries.

Asks Higher Milk Schedules

Higher rates than those provided in the Hawley bill on the milk schedules were asked by G. H. Benkendork, representing milk producers of California and Idaho. Their organization, of which he is general manager, has a membership of 15,000 in these two states. Paragraph 708 in the House bill dealing with milk is inadequate, he said. He asked that the rates of dried whole milk under section (b) be raised from 4½c. per pound to 10c. per pound with a minimum ad valorem of not less than 40 per cent. He also asked that the rates on dried skimmed milk be raised from 2½c. a pound to 4c. a pound with a minimum ad valorem duty of 60 per cent. These revisions would not prohibit the importation of the foreign product but would merely equalize production costs, he stated.

An increase in the butter rate over that provided in the House bill was asked by Harry Hartke, of Covington, Ky., on behalf of the National Milk Producers Federation. He advocated a rate of 15c. a pound on butter and oleomargarine in place of the 14c. rate in the Hawley bill. He also asked that a minimum ad valorem duty of 40 per cent be provided. New Zealand is the principal competitive nation, he said, and it is rapidly developing into a dairying country. After stating that it costs from 23c. to 27c. less to produce butter in New Zealand than it does in this country, he explained that the Antipodes have the advantage of having their season of lowest production costs at the time when the operating costs are the highest in this hemisphere. The proposed rate of 15c. a pound would be adequate against Denmark, he said.

The hearing on June 20 was arranged to accommodate witnesses representing Southern tomato producers, but it was decided to permit L. J. Taber, representing the National Grange, to present the first testimony. Mr. Taber said that although his organization desires to be constructive in its activities there will be a different story if an agricultural drawback is not provided. An agricultural drawback would operate the same as the export debenture plan, he explained. Duties on agricultural products should be increased to the point where they average 40 per cent ad valorem, he said. In expressing this desire for

higher duties, he stated that the present average rate of duty on agricultural products is 22.5 per cent while the rate on industrial commodities averages about 40 per cent. Taking up specific rates, he said that the House has failed to make adequate provision for casein, eggs, buckwheat, potatoes, and onions. His organization will not oppose the increase in the sugar tariff, he said.

Alton E. Briggs, of the Boston Fruit and Produce Exchange, was the first witness to appear on the tomato schedule. He told the committee that the proposed 3c. rate on tomatoes would place them on the luxury list during the winter months and would benefit no one since there is no domestic production during this period. The only period when fresh tomatoes are brought into this country is between December and May, he said, while Florida does not enter into considerable production in quality and quantity until later. V. C. Taggart, of the Fry Brokerage Company, Chicago, declared that although his firm makes the same profit on Florida tomatoes that it does on the Mexican variety, the market will not take the domestic product during the winter months. Frank Bloom, of Bloom & Company, Detroit, also opposed the 3c. rate. He told the committee that he repacks about 466 car lots of tomatoes a year and ripens them under a special process. Often he has to throw away entire car loads, he said.

Senator Fletcher, of Florida, took the stand in defense of the duty provided in the Hawley bill. After stating that there is no justice in the contentions of the importers, he said that the duty is necessary because of the cheap labor in the Mexican fields. This peon labor will work for 75c. a day, he said. L. L. Chandler, of Goulds, Fla., representing the Goulds Growers organization, took issue with the statement that Florida cannot supply the domestic market with tomatoes during the winter months. It costs $280 an acre to produce tomatoes in Florida and only $79 an acre in Mexico, he brought out. At the same time 174 crates are obtained per acre in Florida as against 75 an acre in Mexico, he said. Not only does Florida need protection against the cheap farm labor of Mexico but it also needs protection from discriminatory shipping rates, he told the committee. Florida and Texas are in the same position regarding winter production of tomatoes and have decided to present a common case in asking that the 3c. rate be retained, he said.

New Concrete Elevator for General Mills

The contract has been awarded for the construction of a 2,500,000-bushel concrete terminal elevator at Minneapolis adjoining the plant of Washburn-Crosby Company, Inc. When completed the total elevator capacity of General Mills at Minneapolis will be 6,000,000 bushels.

Industrial Research Planned By Candy Makers

From June 3 to 7, 1929, some 900 persons interested more or less directly in the manufacture of candy and confectionery journeyed to Indiana and registered at the West Baden Springs and French Lick hotels, the official registration being approximately 500. Because of the fact that the convention was held in the West Baden Springs Hotel, with its famous interior court, extremely large for a hotel atrium but by no means able to accommodate a full line of exposition material such as moguls and the like, the equipment and supplies featured at the convention were not so all-inclusive as is ordinarily the case at the annual conclaves of the candy manufacturers.

Nor were technical matters given much prominence in the convention sessions. With the exception of the address of Dr. Harrison E. Howe, editor, *Industrial & Engineering Chemistry*, Washington, D. C., who spoke on "The Earning Power of Industrial Research," practically all talks were of an economic import. They included "Consumer Controlled Profits," by Merle Sidener, Indianapolis, Ind.; "Tying in With the Louisville Survey," by F. J. Nichols, Dayton, Ohio; "Federal Distribution Survey," by R. L. Purdon, Washington; Report of the Work of the National Food Products Protective Committee, by A. M. Kelly, Brooklyn; "What Shall We Tell the Public," by John H. Dunham, president, Dunham-Lesan Advertising Company, Chicago; Report of the Advertising and Educational Committee, by George H. Williamson, Williamson Candy Company, Chicago; and "The Work of the Sugar Institute," by Fred G. Taylor, New York.

For the purpose of planning a research program best suited to the needs of the industry as a whole, the executive committee appropriated $10,000 to be used by the association's committee on education and research, the chairman of which is E. B. Hutchins, vice-president of the Bonita Company, Fond du Lac, Wis. This is essentially a preliminary move and presumably will be followed by further financing as the work progresses.

The convention voted to continue the associational advertising for an additional three-year period, it being hoped that the basis of 0.1 per cent of annual gross sales will produce a fund of $500,000 annually.

The new officers are: President, A. M. Kelly, Wallace & Company, Brooklyn; vice-president, E. B. Hutchins, the Bonita Company, Fond du Lac, Wis.; second vice-president, L. L. McIlhenney, Stephen F. Whitman & Son, Inc., Philadelphia; secretary and treasurer, Walter C. Hughes, who was re-elected. Members of the executive committee are: J. S. Auerbach, D. Auerbach & Sons, New York; Edward M. Becker, the Edw. M. Becker Company, Cleveland; Edwin F. Gibbs, Samoset Chocolates Company, Boston; Charles F. Haug, Mason, Au & Magenheimer Confectionery Manufacturing Company, Brooklyn; E. A. Hoffman, E. A. Hoffman Candy Company, Los Angeles; Malcolm A. McDonnell, Puritan Chocolate Company, Cincinnati; Arno E. Sander, York Caramel Company, York, Pa.; A. H. Shotwell, Shotwell Manufacturing Company, Chicago; John Voneiff, Voneiff-Drayer Company, Baltimore; A. R. Scheble, Richards-Scheble Candy Company, Hutchinson, Kan.; Charles C. Chase, Chase Candy Company, St. Joseph, Mo.; John A. Gurley, Gurley Candy Company, Minneapolis; Porter King, King Candy Company, Fort Worth; E. E. Wood Nichols, Nichols Candy Company, Indianapolis; Harry L. Brown, Brown & Haley, Tacoma; J. M. Gleason, W. F. Schrafft & Sons Corporation, Boston; and A. H. Steere, Littlefield & Steere Company, Knoxville.

Grape Products Merger

Eight large grape products companies at a recent meeting in San Francisco began the work of effecting a merger to be known as Fruit Products, Inc., by ordering the American Appraisal Company to appraise all plants involved. They include Italian Vineyards, Grape Products Corporation, California Wine Association, Community Grape Corporation, Garrett & Company, Colonial Grape Products Company, National Fruit Products Company and B. Cella. The total value is stated to be in the vicinity of $15,000,000 and about twenty plants are concerned. Donald C. Conn, managing director of the Associated Fruit Industries, Inc., presided at the organization meeting.

The sales of products from the 105,000 tons of grapes crushed in 1928 was $20,000,000. In 1929 it is expected that 350,000 tons will be used. The list of products that will be made includes, among beverages, grape concentrate, grape juice, de-alcoholized wine, powdered grapes and frozen grapes in juice; among proprietary medicines, sweet and dry wine, wine tonic, brandy, alcohol, tartaric acid and invert grape sugar; among table products, neutral sirup, fruits and nuts packed in wine, meat sauce, wine jelly, confectionery and grape catsup; among cooking products, wine vinegar, sweet and salted wine, cream of tartar, pectin, spiced wines and brandies, canned grapes, grape colors and yeast; among miscellaneous classification, grape-seed oil, cellulose, dyes, potash and argols. Grape catsup will be manufactured on a commercial scale this year for the first time.

Candy Merger

The General Candy Corporation, Chicago, has acquired the Williamson Candy Company, maker of "Oh Henry" candy bars. George H. Williamson, president of the latter company, is to be the new president, and Max H. Sobel, general manager.

Preservers Ask Opinions On Proposed Standards

In a recent letter to members of the National Preservers Association, Daniel R. Forbes, counsel of the association, has asked for dispassionate opinions regarding the Bill H.R. 2164 which has been substituted for H.R. 1013, advocated by the association. The substitute bill is the one recommended by the Department of Agriculture and contains standards for jams, jellies, preserves and fruit butters that will have far-reaching effects on the industry, for it eliminates the so-called compound class of this group of products, and admits only of "pure" and "imitation" goods.

Mr. Forbes' appeal to his industry is for opinions based on what is best for the whole industry and not on the sentiment of the moment. "Pure" preserves must, under the bill, use 45 lb. of fruit to 55 lb. of sucrose, but it provides that when pectin is added the same ratio must be maintained and that the finished product must contain not less than 68 per cent of water-soluble solids derived from the fruit and sugar used.

Jellies must be fruit juice and sucrose but if pectin is added the jelly shall be 50 per cent fruit juice and 50 per cent sugar, and shall have not less than 65 per cent of water-soluble solids derived from the fruit and sugar.

Apple butter shall contain not less than 40 per cent of water-soluble solids and shall be prepared from not more than 20 lb. of sugar to each 50 lb. of fresh applies, or their equivalent. If enacted, the bill becomes a law on Nov. 1, 1929.

Labels on Hard Candy To Be Revised

Manufacturers of hard candy have been warned by the Food, Drug and Insecticide Administration of the U. S. Department of Agriculture against the use of false statements on their labels as to the content of fruit, fruit juices, or fruit flavor in their product. A notice urging immediate revision of faulty labels to comply with the requirements of the Food and Drugs Act has just been sent to makers of this type of candy.

The provisions of the law regarding labels are that they should bear no representations that are false, misleading, or deceptive in any particular; names or pictorial designs of fruit should be used only when that fruit, or its juice, is present in quantities sufficient to characterize the article. Otherwise if the candy contains merely fruit flavor, even though derived exclusively from the fruit named, the name of the fruit should be used only if qualified by the word "flavor," and without pictorial designs of fruit.

An exception is made as to flavors derived from the oils of citrus fruits. No objection is made to the name "Lemon Drops," or similar names, provided the labels bear no pictorial designs and no representations are made indicating an actual content of fruit or fruit juice.

Harmless acids added to fruit-type hard candies to enhance their fruity characteristics, according to the notice, also are to be declared on the label. The presence of synthetic flavors and artificial colors in the candy must be designated with the word "Imitation" in type of the same size and prominence as the fruit name, in direct conjunction with it, and with the words "artificially flavored and colored" conspicuously displayed upon the label.

Borden Continues to Expand

Announcement has been made of the acquisition of the following plants by the Borden Company: Sharples-Hendler Ice Cream Company, of Wilmington, Del.; Dairy Dale Company and subsidiaries, of California; Springfield Dairy Products Company, and Purity Ice Cream & Dairy Company, both of Springfield, Ohio; Terre Haute Pure Milk & Ice Cream Company, of Terre Haute, Ind.; A. H. Barber & Company, and Grunert Cheese Company, both of Chicago and owning plants in the Middle West; Hammond Dairy Company, of Hammond, Ind.

Further acquisitions are Casein Company of America, with headquarters in New York; Averill Dairy, of Akron, Ohio; Logan Square Dairy, of Chicago; S. Caulfield & Sons, Caulfield's Dairy and Hendley Creamery, all of Toronto; and Irving Park Dairy, of Chicago.

The Casein Corporation, with assets of over $9,000,000, represents one of the largest recent acquisitions, for it is the holding company for the Casein Manufacturing Company, Rosemary Creamery Company, Water Paint Company of America, Dry Milk Company and Erinoid Company of America. Furthermore, the Dry Milk Company operates five plants in New York, Michigan, Missouri, and Wisconsin.

The purchase of all of these plants has been effected by the exchange of Borden stock, with no cash outlay except where it has been necessary to retire bonds and preferred stock issues.

Western Dairy Expansion

The total number of plants now being operated on the Pacific Coast by Western Dairy Products Corporation has been brought up to 48 through the purchase of the California Co-operative Creamery and the Arden Dairy Farms. The purchase comprises seven plants.

Canada Dry vs. Canadian Dry

Canada Dry Ginger Ale, Inc., has filed suit against John do Gerfo, doing business under the name of Magic Beverage Company, asking for an injunction and accounting. Do Gerfo is alleged to have been selling ginger ale under the trade name of "Canadian Dry."

Urge Adequate Processes By Home Canners

In a statement, the importance of which will be apparent to every intelligent commercial canner, Dr. A. F. Woods, director of scientific work, U. S. Department of Agriculture, recently stated that "Research and practical experience have demonstrated that non-acid food products, like asparagus, beans, corn, peas, beets, spinach, fish, and meats, except when adequately cured or adequately acidified, cannot be safely canned by processing in boiling water, but must be sterilized under pressure with approved time and temperature.

"Pressure cookers are now standard equipment and are readily available at small cost. The department does not recommend any particular make, although attention is called to the importance of having the pressure kettle equipped with thermometer and pressure gage for proper control.

"There is now no excuse for continuing to take risks involved in canning non-acid foods without adequate pressure cooking or curing or acidification. All recommendations by the Department of Agriculture will hereafter make this clear and emphatic."

Food Distribution Institute Observes Anniversary

The first anniversary of the formation of the American Institute of Food Distribution was celebrated by a party at the Hotel Commodore, New York, May 28, attended by about 50 men prominent in the food industry—not forgetting the guest of honor, Mrs. Charles B. Knox, the well-known grocery specialty manufacturer. Addresses were made by Arthur P. Williams, Gordon C. Corbaley, H. W. Phelps, and John P. Thomy.

Organized by Mr. Corbaley a year ago with an original membership of 17, the Institute now has a thousand members, practically all of whom are concerned with the problems of distribution. Plans for the ensuing year were outlined by Mr. Corbaley. The other speakers in great measure stressed the need for the work voluntarily undertaken by the founder of the Institute and besought its furtherance by all who may profit thereby.

Zerban Honored

Dr. F. W. Zerban, chief chemist of the New York Sugar Trade Laboratory, was elected president of the International Association of Cane Sugar Technologists at its recent meeting at Sourabaya, Java, Dutch East Indies. The International Association is a world-wide organization of sugar technologists who meet every three years. Dr. Zerban was secretary of the organization from 1926-1929, and will be its president until 1932, when it will meet in Porto Rico. He will return to the United States about mid-August.

Macaroni Manufacturers Hold Enthusiastic Convention

AT ITS 26th annual convention, June 18 to 20, in New York—a meeting unique in point of attendance and enthusiasm—the National Macaroni Manufacturers Association elected as officers for the ensuing year Frank J. Tharinger, president; G. Guerrisi, vice-president; G. G. Hoskins, managing director; and M. J. Donna, secretary-treasurer. Directors newly elected and in addition to the present members are William Culman, of Long Island City, and John Ravarino, of St. Louis.

Although distribution was the keynote of the convention, ways to popularize macaroni products having been discussed at great length, at least two papers of technical importance to food manufacturers were presented. "Improving Protein and Color Qualities in Macaroni Wheats," by Thomas C. Roberts, of Washburn-Crosby Company, was a discussion that will be of interest to all wheat users. It will be presented in a forthcoming issue of FOOD INDUSTRIES. Another paper of interest to production men was Mr. Traficanti's discussion of packaging noodles in transparent containers, under the title "The Value of the Transparent Package," which is presented herewith in abridged form.

Dr. Attilio H. Giannini, president of the Bank of America, addressed the convention, urging the exercise of faith in each other and co-operative understanding of merchandizing problems as the solution of most present-day difficulties.

"The desire of the buying public to see what they buy has resulted in a growing use of a transparent type of package, one that combines visibility with protection," said Mr. Traficanti. "Displayed on the dealer's counter the appetizing goodness of these food products is clearly seen and as a result customers buy with confidence.

"Today, what do we see as a result of this development? In the meat industry Armour, Swift and other meat packers selling their bacon, dried beef, sausage and now, even whole hams, in this transparent type of package. In the baking field we see Drake and others selling cakes as well as Ward and many more selling cookies in this transparent wrapper. In the fish industry the new frosted fillets as well as smoked herring and other items are being sold in this type of package. Turning to the dried fruit industry, we see millions of packages of dates, figs, prunes and apricots displayed in this transparent form. And so it goes. In addition to the above food items, tea, honey, candy and many other products are enjoying the added sales appeal of the transparent wrapper.

"One of the outstanding reasons for the success of the new type of package is the fact that it *suggests* the product to the housewives for their menu, and thus sales are made to customers who come to the store who would have not thought of buying that particular item, if the goods had not been visible. In the case of noodles this point is, I believe, the prime reason for considering the transparent package. It suggests these items to extra buyers and this means added sales.

"The transparent package is an ideal display unit, convenient, attractive and easy to buy. It shows the product and makes the noodles *their own salesman*. I first became interested in it because I believed it could increase noodle and macaroni sales in the same way it was increasing sales of other items. Coming at the time when the association had finally succeeded after many years of effort, in abolishing coloring, I thought it best that the public should see the noodles as they actually are when made without color. The Cellophane manufacturers were advertising the advantages of this new type of wrap to the public and I believed it would benefit us to tie up with this new idea. Our sales of these packages have been very satisfactory and I understand the use of the transparent wrapper in the noodle industry has grown by leaps and bounds.

"Of course, like with any other new thing, we had some production problems. But practice makes perfect and we are now able to get quite an excellent rate of production. We had some breakage, too, at times of severe cold weather, and this indicated that we should use a heavier wrapper. We did that and our breakage was greatly reduced. I understand that, with millions of transparent noodle packages marketed during the extremely cold season, the percentage of breakage is very small indeed. I believe the Du Pont Company has made a thorough survey of past experience in production methods and breakage troubles and expects to have some production economies to recommend, as well as methods of minimizing breakage in the future winter seasons."

To Determine the Size of Mayonnaise Industry

At the request of the Mayonnaise Products Manufacturers Association the U. S. Department of Commerce is sending out a questionnaire to all known manufacturers of mayonnaise and related products which will determine the volume of the business done, the amount of goods sold, kind of products, and methods of distribution. The industry has been developing very rapidly and feels the need of adequate statistics, which the Department of Commerce is collecting as an impartial fact-finding body.

Casein Imports Increasing

Exports of casein from Argentina to the United States in 1928 were 23,275,110 lb., valued at $2,895,000. This represents an increase of 11 per cent in quantity and 15 per cent in value over imports from Argentina in 1927, when 19,589,813 lb., valued at $2,460,564, was imported.

Silica-Gel Refrigerator Cars Growing in Popularity

Orders have been placed for 50 additional silica-gel refrigerator cars by Safety Refrigeration, Inc., owner of this type of iceless refrigerator cars. Twenty-five of the new cars are for the exclusive service of the Atlantic Coast Fisheries and will bring its fleet up to 50 when the delivery is completed. The other cars are for general service in the same manner that any of the iced refrigerator cars of the older types are used.

The advantage of the silica-gel cars lies in their ability to hold temperatures below the freezing point. They are very important factors in the distribution of frozen foods and are of growing importance in fresh food distribution. Two of these cars are at present being moved weekly between Wichita, Kan.; Buffalo and New York City by the Jacob Dold Packing Company for the transportation of fresh pork loins.

Ice Cream Cans Standardized

By means of a survey conducted in 1928 by the simplified practice committee of the International Association of Ice Cream Manufacturers, it was found that of 5-gal. cans there were in general use 11 different sorts; of 3-gal., 13; of 2-gal., 10; of 1-gal., 8.

It was decided to recommend confining all future purchases to two sets of dimensions (tall and squat) for 5-gal. cans, two sets of dimensions for 2½-gal. cans, and one set of dimensions for 1-gal. cans. The 2½-gal. size was added because two of them can be used, when desired, in refrigerated cabinets designed for 5-gal. cans.

Work is now in progress on the standardization of molds and cartons for use with brick ice cream.

Statistics of Cold Storage Holdings of Frozen Fish

Figures obtained by the Bureau of Fisheries of the Department of Commerce as of May 15, 1929, and the same date 1928 show an increase in the total quantity of frozen fish in storage. The current figure is 30,119,002 lb. as compared with 26,512,846 lb. last year. Nearly 7,000,000 lb. of fish was frozen in the month between April 15 and May 15, 1929.

The largest increases in the fish in storage occurred in the cod-haddock-hake group; halibut; and herrings.

New Ashcroft Hancock Office

Consolidated Ashcroft Hancock Company, Inc., announces the change in address of its general sales office from New York to Bridgeport, Conn., effective July 1.

New Package Announced by Atlantic Coast Fisheries

At the recent convention of their distributors of frozen fillets held at Groton, Conn., the Atlantic Coast Fisheries announced the development of a new type of package that will be in commercial production in the fall. In the new package the portions will be circular steaks free from skin and bone, all of uniform size and thickness, three of which will weigh one pound.

The important manufacturing features of the new style fillet will be that all operations will be performed automatically and will result in a uniform standardized product as well as definite economies of manufacture. From the viewpoint of the housewife the new portions also will offer interesting features, largely to the end that each steak will be of proper size for an individual portion, and that any variation in the rate of cooking due to irregularity of size of pieces will be avoided. The new method of packing was developed in the research department of the company under the direction of Harden F. Taylor, vice-president.

Trade Commission to Probe False Advertising

False and misleading advertising published in newspapers and periodicals will be investigated from time to time by a special board of investigation that has just been named by the Federal Trade Commission, the board consisting of three of the Commission's attorneys. All inquiries will be based on section 5 of the Federal Trade Act, prohibiting unfair methods of competition.

In connection with carrying on a survey of published advertising the board will hold preliminary hearings on cases having to do with unfair advertising. An informal examination of newspaper and periodical advertising has been under way for several months, so that there are now a number of cases ready for review.

Hearings before the board will not be public because the Commission's rules on publicity do not permit a case to be made public prior to issuance of complaint.

Erratum

In order that historical accuracy may be served there should be a correction in the sentence in January FOOD INDUSTRIES, on page 168, which, in referring to the early days of the research laboratory of the National Canners' Association, now reads, "The laboratory was started on April 1, 1913, directed by Dr. W. D. Bigelow, and on the initial staff were Dr. F. F. Fitzgerald, Dr. A. W. Bitting and his wife, Mrs. Kate G. Bitting." The sentence should have read: "The laboratory was started on April 1, 1913, with W. D. Bigelow as chemist and Dr. A. W. Bitting as technologist. On the initial staff were Mrs. K. G. Bitting, Dr. F. F. Fitzgerald, and H. M. Miller. In 1918 W. D. Bigelow became director of research laboratories."

The name of Roger Lueck was inadvertently omitted on page 222 from the list of those who helped to develop the "C-enamel" for corn cans. Patent No. 1,667,212 was issued to him on April 24, 1928. Patent No. 1,699,274 was issued to Dr. G. S. Bohart on Jan. 15, 1929.

The last paragraph of page 223 refers to Meyer at Stanford University, whereas it should have referred to him at the Hooper Foundation for Medical Research at the University of California. The name of Dickson, of Stanford, also should be included among those who have made studies of certain forms of food poisoning, notably of botulism.

South Africa Grows Pineapple

Forty-five hundred acres of pineapples is under cultivation by the Co-operative Farmers Union in the Union of South Africa. One hundred acres is under the Smooth Cayenne variety, which is grown in the Hawaiian Islands, while 4,400 acres is under the Queen variety. The average production of pineapples is roughly one ton per acre per year. The Farmers Union plans to can the crop.

Bureau Studies Fish Storage

The Bureau of Fisheries of the Department of Commerce will conduct several technological studies at the Reedville laboratory this summer on fishery products and byproducts. Time and temperature storage tests on fish will be made as well as studies of the methods of treating ground-fish waste and the effects of drying with superheated steam. Net preservative tests, now in progress, are to be continued and extended.

PERSONALS

FREDERICK BEERS, vice-president of the National Biscuit Company, was made president of the company on May 23, succeeding Roy E. Tomlinson, now chairman of the board. He began work with National Biscuit as a timekeeper in 1902 soon after his graduation from Yale. In 1921 he had risen to the position of manager of production, and was made a vice-president in 1928.

FRANK B. DEMOTTE who sold his holdings in the Warrensburg Canning Company, Warrensburg, Ill., and resigned as vice-president and director late in 1928, is one of the incorporators of the Princeville Canning Company, at Princeville, Ill. Associated with him are Russell Hunter and Henry Truit, of Princeville.

C. G. HARRELL, of the Continental Bakeries Corporation, has been elected vice-president of the American Association of Cereal Chemists.

J. C. HARRIS, formerly in charge of the Bernard Lodge sugar mill in Jamaica, B. W. I., before its sale to the United Fruit Company, has been appointed general superintendent of all of United's plants in Jamaica, which are located at Amity Hall, Morelands and Bernard Lodge.

J. S. HICKS, assistant director of research of the Hecker H-O Milling Company, of Buffalo, has resigned and is now with the National Anilin & Chemical Company, of Buffalo.

HARRY HODGSON, of the Hodgson Oil Refining Company, of Athens, Ga., was recently elected president of the Interstate Cottonseed Crushers' Association.

AUSTIN T. HYDE, who recently resigned from the Walter Baker Chocolate Company, is division superintendent of the Calco Chemical Company at Bound Brook, N. J.

STUART L. JAFFRAY has been elected vice-president of the Malt Diastase Company, of Brooklyn, N. Y.

L. W. MASON has been appointed general manager of the Mantecoco Company at Manila, P. I. Recently he resigned from his position as chief chemist of the Portland Vegetable Oils Company to design and supervise construction of the Mantecoco plant for the production of lard compound and refined vegetable oils.

A. C. MERRILL has resigned from the general superintendent's department of Swift & Company and is now professor of dairy products manufacturing at the Utah State Agricultural College, Logan, Utah.

F. S. MORISON, formerly chemist of Jos. Middleby, Jr., Inc., has resigned to accept a similar position with Cary Maple Sugar Company, of St. Johnsbury, Vt.

LEONARD J. SCHWARZ, American Trade Commissioner on the Gold Coast, West Africa, with headquarters at Accra, has returned to the United States for his annual vacation in a temperate climate and will remain here until Aug. 1. Mr. Schwarz who was formerly with the Bureau of Chemistry, made his first trip to Accra for the Bureau a few years ago to study the causes of molding of cacao beans. He is now with the Department of Commerce and furnishes the reports on the movement of cacao from West African territory.

G. S. Scott, recently of American Can Company's research department, is now director of research for the Minnesota Valley Canning Company, of Le Sueur, Minn.

W. Reid Stryker, superintendent of refining processes, Southport Mill, Ltd., of New Orleans has been elected president of the American Oil Chemists' Society.

Roy E. Tomlinson, president of the National Biscuit Company since 1917, has been made chairman of the board of directors of that company, a position that had been vacant since the death of William Moore in 1924.

F. Edson White, president of Armour & Company, has been elected a director of Montgomery Ward & Company.

Henry F. Williamson, formerly of the Colgate-Palmolive-Peet Company, where he was in charge of the edible products division, is now Pacific Coast manager of the Glidden Food Products Company's Pacific Coast branch at San Francisco.

S. H. Wright, superintendent of the new Dekalb, Ill., plant of the Midwest Canning Corporation, a subsidiary of the California Packing Corporation, has been appointed district superintendent of the Midwest company's plants at Cambria and Arlington, Wis.

OBITUARY

William J. Cooper, 87, who entered the ice cream business in 1882 at Asbury Park, N. J., and was the pioneer in that line in his own city, died June 1.

Robert M. Eagle, 57, died recently in Kansas City, Kan. In his earlier days he was with Armour & Company for twenty years. Later he was superintendent of Thomas Lipton's plant in Chicago, and next, head of J. Y. Griffin & Company of Winnipeg. After the business was taken over by Swift & Company, he went to Pittsburg, Kan., to be manager of Hull & Dillon Packing Company, after which he organized the Eagle Company, manufacturing animal biological products.

Robert Douglas, of Rochester, N. Y., died at his home on May 28, at the age of 70. His name will always be associated with pectin, for he held several important patents relative to its manufacture in concentrated liquid form. In 1911 he organized the Douglas Pectin Company with a plant at Fairport, N. Y. Later the name of the company was changed to the Certo Corporation. Considerable patent litigation developed during the last few years that was recently adjudicated in favor of the Certo Corporation. On March 1, soon after the favorable decision, announcement was made of the merger of Certo with Postum, and Mr. Douglas, president of the company, retired. He had been in poor health for a number of years. His brother, Charles Douglas, is still in charge of manufacturing operations at the Fairport plant.

Washington B. Thomas, 72, former president of the American Sugar Refining Company and a retired capitalist, died May 29 at his Boston home. After graduating from Harvard in 1879 he began work with the Standard Sugar Refining Company and later joined the American Sugar Refining Company. He was president of the latter from 1908 to 1911 and later chairman of the board.

Henry W. Wendt, 67, president of the Buffalo Forge Company, died at his Buffalo home June 12 of pneumonia. His company first manufactured blacksmiths' forges, later heating and ventilating apparatus and other lines. As many as 30 years ago he fostered informal industrial research, toward which he steadfastly maintained a sympathetic attitude.

Philip Wunderle, 85, candy manufacturer and head of Philip Wunderle & Sons, died June 17 at his home in Edgehill, Pa., after a short illness. He was a native of Germany and came to America about the time of the Civil War. Soon afterward he started a candy factory and was active in the business until his recent illness.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Bakery—W. Alejos, Mission, Tex., will build a 1 story, 40 x 70 ft. bakery. Private plans. Work will be done by owners forces. Equipment for making bread, cake, etc., will be required.

Bakery—R. H. Bradley, 4809 South Main St., Los Angeles, Calif., awarded contract for a 1 story, 100 x 137 ft. bakery at 3861-63 Adair St. to Guardian Bldg. Corp., 1200 South Hill St., Los Angeles. Estimated cost $30,000.

Bakery—Continental Bakery Co., 855 Housatonic Ave., Bridgeport, Conn., awarded contract for the construction of a bakery on Wells St. to E. & F. Construction Co., 94 Wells St., Bridgeport. Estimated cost $100,000.

Bakery—Fehr Baking Co., 1919 North Comal St., San Antonio, Tex., plans the construction of a bakery at Corpus Christi, Machinery and equipment will be required.

Bakery—General Baking Co., 420 Lexington Ave., New York, N. Y., awarded contract for a 2 story, 61 x 237 ft. bakery at Georgia Ave. and W St. N.W., Washington, D. C., to C. L. Stockhausen Co., Gay and Water Sts., Baltimore, Md. Estimated cost $250,000.

Bakery—Jackson Bread Co. Ltd., Hamilton, Ont., awarded contract for the construction of a bakery to Poag & Kamp, 9 Westinghouse Ave., Hamilton. Estimated cost $40,000.

Bakery — F. Jaeger, 915 Bergenline Ave., Union City, N. J., awarded contract for a 2 story, 25 x 100 ft. bakery to E. Arena, 132 41st St. Union City. Estimated cost $40,000.

Bakery—Rubel Baking Co., 574 West 6th Ave., Cincinnati, O., will receive bids in August for the construction of a bakery. McCormick Co., 41 Park Row, New York, N. Y., is architect.

Bakery—San Joaquin Baking Co., C. M. Bowersmith, Mgr., Modesto, Calif., is having preliminary plans prepared for the construction of a bakery at 10th Ave. and Needham St. Estimated cost $125,000. Architect not announced.

Bakery—Vietmeyer Bros., 175 Sherman Ave., Jersey City, N. J., will not construct a 2 story addition to bakery. Estimated cost $50,000. W. Newman, 40 Journal Sq., Jersey City, Archt. Project abandoned.

Bakery Plant Equipment — General Baking Co., 415 Buckingham St., Columbus, O., is in the market for equipment including mixing machine, moving oven, etc., for proposed 1 story, 150 x 181 ft. bakery.

Bakery & Coffee Roasting Plant—Bird Stores Inc., 2101 Broadway, Kansas City, Mo., had plans prepared for the construction of a bakery and coffee roasting plant at 206th St. and Wyandotte Ave. Estimated cost $200,000. Archer & Gloyd, 916 Pioneer Trust Bldg., Kansas City, are architects and H. Von Unwerth, Finance Bldg., Kansas City, is engineer.

Bakery and Coffee Plant—S. Skaggs-Safeway Stores Inc., 2101 Broadway, Kansas City, Mo., will soon award contract for a 4 story, 100 x 140 ft. bakery and coffee plant. Estimated cost $200,000. H. Von Unwerth, 705 Finance Bldg., Kansas City, is engineer.

Bottling Plants—Coca Cola Bottling Co., Anniston, Ala., awarded contract for the construction of a 2 story, 49 x 70 ft. plant at Tallula, La., to Mickey O'Brien, Monroe, La. $50,000; awarded masonry contract for a 2 story, 116 x 297 ft. plant at Chicago, Ill., $200,000; will soon award contract for a 2 story, 71 x 114 ft. plant at Gadsden, Ala.; plans a plant at Hamilton, Ont., to double capacity. Cost including equipment $100,000.

Bottling Plant—Nugrape Bottling Co., R. V. Grayson & Associates, Macon, Ga., plans the construction of a 1 story bottling plant. Estimated cost $35,000.

Candy Factory—Bonnie Jean Candy Shops, 125 West 5th St., Los Angeles, Calif., is having plans prepared for the construction of a 2 story, 40 x 135 ft. candy factory on Beverly Blvd. B. Dale, 7220 Beverly Blvd., Los Angeles, is architect.

Candy Factory—Marshall Peanut Candy Co., c/o J. B. Reeves, Marshall, Tex., plans the construction of a candy factory. Estimated cost $25,000. Machinery and equipment will be required.

Candy Manufacturing Shop, etc.—D. L. Hancock, Chilmark, Mass., is having plans prepared for the construction of a candy manufacturing shop, etc. Estimated cost $40,000. Private plans.

Canning Plant — Columbia Conserved Co., Churchman Ave. and Belt Rd. R., Indianapolis, Ind., awarded contract for a 55 x 217 ft. canning plant to E. Weddle, 4050 North Capitol St., Indianapolis. Estimated cost $41,400.

Canning Plant — Income Properties Co. of California, Oakland, Calif., awarded contract for the construction of a 2 story canning plant on 9th Ave. to Cahill Bros., 206 Sansome St., San Francisco. Estimated cost $50,000.

Canning Plant—Peru Canning Co., Peru, Ind., awarded contract for a 1 story, 60 x 150 ft. canning plant at Oakdale and Chili Sts. to C. Clifton & Son, 231 East River St., Peru. Estimated cost $40,000.

Canning Plant (Fruit and Vegetable)—Cooke County Truck & Fruit Growers Assn., Gainesville, Tex., plans the construction of a fruit and vegetable canning plant.

Canning Plant (Fruit and Vegetables) — Stock Co., c/o W. S. Windsor, Robstown, Tex., plans the construction of a fruit and vegetable canning plant. Estimated cost $35,000. Private plans.

Canning Plant Addition — Matzka Products Co., Lodi, Calif., awarded contract for addition to canning plant to Davis-Pearce Co., Grant and Weber Sts., Stockton, Calif. Estimated cost $23,500.

Canning Plant Equipment—C. H. Austin Brokerage Co., Springfield, Mo., is receiving bids for machinery and equipment for proposed 1 story, 60 x 90 ft. vegetable and citrus fruit canning plant. Private plans.

Creamery—Producers Produce Co. Inc., W. Steeples, Mgr., St. Louis and Mill Sts., Sedalia, Mo., plans the construction of a creamery. Estimated cost $150,000.

Creamery—Edwardsville Creamery Co., M. Jensen, Mgr., Edwardsville, Ill., awarded contract for the construction of a 2 story, 50 x 100 ft. creamery. Estimated cost $40,000.

Creamery Addition—Golden State Milk Products Co., 1120 Towne Ave., Los Angeles, Calif., plans the construction of two open loading docks, 40 x 161 and 40 x 162 ft. in connection with creamery. Estimated cost $20,000.

Creamery—Kendall Co-Operative Creamery Co., Kendall, Wis., awarded contract for the construction of a 54 x 124 ft. creamery to Tapager Construction Co., Albert Lea, Minn. Estimated cost $30,000.

Creamery Addition—Adohr Creamery Co., 1801 La Cienega Blvd., Los Angeles, Calif., plans addition to creamery. Estimated cost $200,000. Morgan, Walls & Clements, Van Nuys Bldg., Los Angeles, Calif., are architects.

Creamery and Powdered Milk Plant—Nodaway Milk Products Co., c/o W. F. Phares, Chn. Building Committee, Farmers Trust Bldg., Maryville, Mo., will soon award contract for a 1 and 2 story, 69 x 150 ft. creamery and powdered milk plant at Maryville. Estimated cost $200,000. Douthitt Engineering Co., 100 West Monroe St., Chicago, Ill., is engineer.

Dairy — Berkdale Dairy Co., St. Boniface, Man., plans the construction of a dairy. Estimated cost $75,000.

Ice Cream Factory—Schwen Ice Cream Co., Blue Earth, Minn., will receive bids until July 8 for the construction of a 2 story ice cream factory. Estimated cost $30,000. C. A. Berger, 401 Phoenix Bldg., Minneapolis, is engineer.

Milk Depot—B. Munday, 322 West 22nd St., New York, N. Y., plans the construction of a 2 story, 91 x 92 ft. milk depot at 435 West 18th St. Estimated cost $45,000. W. M. Farrar, 250 8th Ave., New York, is architect.

Milk Depot—Sheffield Farms, Inc., 524 West 57th St., New York, N. Y., awarded contract for the construction of a milk depot at Gravesend Neck, and East 17th St., Brooklyn, to P. Sterling, 33 West 42nd St., New York. Estimated cost $50,000.

Milk Plant—S. L. Bingham, Downey, Idaho, is having plans prepared for the construction of a milk plant. Estimated cost $200,000. Architect not announced.

Milk and Butter Plant — Douthitt, Gray, Johnson Co., c/o I. J. Miller, Corpus Christi, Tex., plans the construction of a milk and sweet cream butter plant near Beeville. Estimated cost $200,000.

Bean Plant—Stock Co., c/o Chamber of Commerce, Alice, Tex., plans the construction of a bean and black-eyed pea manufacturing plant. It is planned to cure by drying and heating process to dehydrate the beans and peas, preparatory to shipping. Estimated cost $35,000.

Cornstalk Products Plant Addition — Cornstalk Products Co., Danville, Ill., will build addition to plant. Estimated cost $400,000. Private plans. Work will be done by owners forces.

Food Products Plant — H. C. Bohack Co., Metropolitan and Flushing Aves., Flushing, N. Y., plans the construction of a 3 story, 41 x 69 ft. plant. Estimated cost $60,000. Koch & Wagner, 32 Court St., Brooklyn, are architects.

Food Products Factory—W. K. Kellog Co., 246 Champion St., Battle Creek, Mich., is having plans prepared for the construction of a 5 story food products factory on Stoles St. Estimated cost $750,000. Architect not annaunced. Equipment will be required.

Food Products Plant and Warehouses—Great Atlantic & Pacific Tea Co., 420 Lexington Ave., New York, N. Y., negotiating for premises to be constructed to their specifications for food products plant at Terre Haute, Ind., $500,000; also plans a 4 story warehouse at Indianapolis, Ind. $150,000, and awarded contract for a 5 story warehouse at Milwaukee, Wis. to L. L. Leveques, Edgehill Rd., Columbus, O. $200,000.

Grocery Warehouse—Frankford Grocery Co., J. O. Edgar, Unit and Penn Ave., Philadelphia, Pa., awarded contract for a 4 story, 50 x 235 ft. warehouse, to W. F. Lotz, Frankford and Oxford Aves. Estimated cost $250,000.

Grocery Warehouse—Western States Grocery Co., c/o C. C. Carpenter, 631 South 3rd West St., Salt Lake City, Utah, plans the construction of a warehouse. Estimated cost $200,000. E. F. Pierce, 1209 First National Bank Bldg., Ogden, Utah, is architect.

Grocery and Confectionery Warehouse — F. Sanders, 2465 Woodward Ave., Detroit, Mich., awarded contract for a 4 story, 250 x 310 ft. grocery and confectionery warehouse on Brooklyn Ave. to Everett Winters, 1651 East Grand Blvd., Detroit.

Nut Margarine Factory—Standard Nut Margarine Co., 1102 Roosevelt Ave., Indianapolis, Ind., awarded contract for the construction of a 2 story, 45 x 150 ft. factory to A. Hedgard, 331 Hampton Dr., Indianapolis. Estimated cost $49,000.

Refinery (Beet Sugar)—American Beet Sugar Co., Steel Bldg., Denver, Colo., awarded contract for a 69 x 212 ft. sugar refinery at Belmond, Ia. to M. M. Moen & Co., Mason City, Ia.

Spaghetti Factory—Boston Spaghetti Mfg. Co., 16 Cross St., Boston, Mass., awarded contract for the construction of a 5 story factory to R. J. Gauvreau, 11 Beacon St., Boston. Estimated cost $40,000.

Tea Factory—Jewell Tea Co., 5 North Wabash Ave., Chicago, Ill., will soon award contract for a 2 and 5 story, 100 x 400 ft. tea factory at Barrington. Estimated cost $1,000,000. Holabird & Roote, 333 North Michigan Ave., Chicago, are architects.

Vinegar Plant—Speas Mfg. Co., 2600 Front St., Kansas City, Mo., awarded contract for the construction of a 60 x 107 ft. vinegar plant to E. L. Bryant, 618 Lafayette St., Kansas City.

Distillery—Carling Breweries Ltd, C. Burns, Mgr., Talbot St., London, Ont., plans to completely remodel present building, also 3 story, 150 x 200 ft. addition and new boiler house on Whitehall St., Chatham. Estimated cost $250,000. Private plans. Work will be done by day labor. Complete equipment will be required.

Grain Elevator — Arcoma Grain Co., Fort Smith, Ark., is having preliminary plans prepared for the construction of a grain elevator at Stigler, Okla. Estimated cost $25,000. Private plans.

Grain Elevator—Atlanta Flour & Grain Co., 42 Mangham St., Atlanta, Ga., plans the construction of a 4 story grain elevator. Estimated cost $60,000.

Grain Elevator — Chicago, Burlington & Quincy R.R., 10th and Farnam Sts., Omaha, Neb., awarded contract for a 46 x 228 ft. grain elevator at First and Grover Sts. to Burrell Engineering & Construction Co., c/o owner, $150,000; also soon takes bids for a grain elevator, 1,250,000 bu. capacity and work house at St. Louis, Mo. $500,000. A. W. Newman, Chicago, is chief engineer.

Grain Elevator—Midland Simcoe Elevator Co., J. Playfair, Pres., Midland, Ont., awarded contract for the construction of addition to grain elevator 2,000,000 bu. capacity on waterfront to G. L. Campbell, 248 McCrod St., Montreal, Que. Estimated cost $600,000. Grain handling equipment, etc. will be installed.

Grain Elevator—Robin Hood Mills Ltd, Moose Jaw, Sask., awarded contract for the construction of a grain storage elevator, 850,000 bu. capacity to Carter Halls, Aldinger Co., Union Bldg., Winnipeg, Man. Estimated cost $200,000. Equipment will be installed.

Grain Elevator—United Grain Growers Ltd, Russell, Man., plans the construction of a grain elevator. Estimated cost $200,000.

Grain Elevator—West Coast Grain Co., Calgary, Alta., plans to rebuild grain elevator recently destroyed by fire on East Calgary St. Loss $100,000. Machinery and equipment will be required.

Grain Elevator Addition — Alberta Wheat Pool, Calgary, Alta., awarded contract for addition to grain elevator, 2,750,000 bu. capacity to include sixty bins, each 100 ft. high at Vancouver, B. C., to Carter-Halls-Aldinger Co., 510 Hastings St. W., Vancouver, B. C. Estimated cost $700,000.

Grain Elevator Addition—Buckerfield's Ltd., Rogers Ave., Vancouver, B. C., awarded contract for addition to grain elevator, including eighteen bins, 14 ft. in diameter, to Northern Construction Co., and J. W. Stewart, 736 Granville St., Vancouver. Estimated cost $100,000.

Grain Elevator Addition—Midland Pacific Terminal Ltd, 602 Hastings St. W., Vancouver, B. C., awarded contract for addition to grain elevator, 1,000,000 bu. capacity to include storage bins, etc., at North Vancouver to Northern Construction Co. and J. W. Stewart Ltd, 736 Graville St., Vancouver. Estimated cost $225,000.

Grain Elevator Addition—Sheffield Elevator Co., 502 Flour Exchange Bldg., Minneapolis, Minn., awarded contract for addition to grain elevator, also separate cleaning house on Garfield St. to J. H. Brown Co., 621 South 3rd St., Minneapolis. Estimated cost $150,000.

Grain Elevator System—Missouri-Kansas & Texas R.R., Railway Exchange Bldg., F. Ringer, Ch. Engr., Missouri Pacific R.R., Missouri Pacific Bldg., St. Louis, Mo., E. A. Hadley, Ch. Engr., and Gulf, Colorado & Santa Fe Ry. Co., F. Merrill, Ch. Engr., Galveston, Tex., plan to increase grain elevator system from 500,000 to 1,000,000 bu. at Texas City, Tex. Estimated cost $250,000.

Grain Elevator and Mill—Universal Mills, G. J. Stone, Pres., Riverside, Fort Worth, Tex., awarded contract for the construction of a grain elevator and mill to C. M. Davis, 405 Cotton Exchange Bldg., Fort Worth. Estimated cost $74,700.

Grain Elevator and Warehouse — Grimes Farm Center, Grimes, Calif., plans to rebuild grain elevator and warehouse, 1 story, 50 x 450 ft. destroyed by fire. Estimated cost $85,000.

Grain Storage Elevator—Postum Co., Inc., Battle Creek, Mich., has work under way on a 200,000 bu. grain storage elevator. James Stewart & Co., 343 South Dearborn St., Chicago, Ill., are engineers.

Grain and Feed Plant—Farmers Grain Co., W. G. Dinwiddie, Pres., Tulia, Tex., awarded contract for the construction of a grain and feed plant, 40,000 bu. capacity equipped with 500 bu. per hour direct heat drier at Hart, Tex., to Fuller Lehigh Co., Fullerton, Pa.

Mixed Feed Plant—Central Farm Products Co., 309½ Austin Ave., Waco, Tex., awarded contract for a 30 x 40 ft. mixed feed plant to J. S. Harrison & Co., Waco. Estimated cost $45,000.

Soy Bean Mill and Grain Elevator—Shellabarger Grain Products Co., Decatur, Ill., is having preliminary plans prepared for a 5 or 6 story soy bean mill and grain elevator at Brush College Rd. Estimated cost $60,000. Horner & Wyatt, 468 Bd. of Trade Bldg., Kansas City, Mo., are engineers.

Cold Storage Plant—S. Steinmet, 61 School St., Yonkers, N. Y., will soon award contract for a 3 story cold storage plant. Estimated cost $200,000. J. Watson, City Hall, Yonkers, is architect.

Cold Storage Warehouse—Mutual Ice & Cold Storage Co., c/o G. Lawrence, Secy. and Mgr., 112 East First St., Topeka, Kan., awarded contract for a 2 story, 75 x 98 ft. cold storage warehouse at First and Quincy Sts. to F. M. Spencer & Co., 1805 Harrison St., Topeka. Estimated cost $75,000.

Cold Storage and Ice Plant—Medford Ice & Storage Co., Medford, Ore., will build a 2 story, 77 x 180 ft. cold storage and ice plant. Estimated cost $80,000 to $100,000. A. T. Berger, Medford. Work will be done by day labor.

Cold Storage and Ice Plant—H. C. Wagner and L. B. Mead, 1515 Water St., Corpus Christi, Tex., plan the construction of a cold storage and ice plant, 20 ton capacity. Private plans. Owners closing proposals for machinery and equipment.

Cold Storage Plant and Wharf and Grain Elevator Additions—Vancouver Harbor Commissioners, 525 Seymour St., Vancouver, B. C., plans the construction of a fish wharf and cold storage plant, also additions to three grain elevators, 7,500,000 total capacity at Barrard Inlet. Estimated cost $1,500,000 and $3,000,000 respectively. H. W. Frith, 525 Seymour St., Vancouver, is engineer.

Ice Plant—J. B. Curry, Raymondville, Tex., will build a 20 ton ice plant at San Perlita. Estimated cost $25,000. Private plans. Work will be done by owners forces.

Ice Plant—Perth Amboy Coal & Ice Co., 558 State St., Perth Amboy, N. J., awarded contract for the construction of a 1 story, 100 x 200 ft. ice plant at Fayette and Goodwin Sts. to A. C. Windsor, 717 Broadway, Newark, N. J. Estimated cost $75,000.

Ice Plant—Prudential Ice & Coal Co., 1163 Herkimer St., Brooklyn, N. Y., will soon award contract for the construction of an ice plant at 1329 Willoughby St. Estimated cost $125,000. C. P. Cannelia, 1163 Herkimer St., Brooklyn, is architect.

Canning Plant (Fish) — Monterey Sardine Products Co., c/o N. Crivello, Monterey, Calif., awarded contract for the construction of a 100 x 260 ft. canning plant including equipment to J. H. Clark, Pacific Grove, Calif. Estimated cost $150,000.

Filleting Plant—Gorton Pew Fisheries Co., 327 Main St., Gloucester, Mass., awarded contract for a 3 story filleting plant on Rogers St. to The Scully Co., 238 Main St., Cambridge, Mass. Estimated cost $40,000.

Fish Hatchery—Kentucky Game & Fish Commission, J. L. Trumbo Executive Agt., Frankfort, Ky., awarded contract for the construction of a fish hatchery at Wooford to J. M. Perkins Construction Co., Frankfort. Estimated cost $40,000.

Fish Storehouse and Produce Building—City Lease & Building Corp., G. B. Long, Mgr., 11 Beacon St., Boston, Mass., awarded contract for a 3 story, 140 x 365 ft. fish storehouse and produce building on Northern Ave., South Boston. Estimated cost $500,000. Great Atlantic & Pacific Tea Co., lessee.

Canning Plant (Meat)—Southern Canning Co., c/o L. L. Luter, Laredo St., San Antonio, Tex., plans the construction of a meat canning plant and slaughter house. Estimated cost $35,000. Private plans. Machinery and equipment will be required.

Packing House (Meat)—Henschen & McLaren, 1637 Prairie Ave., Chicago, Ill., Archts., will receive bids about July 1 for the construction of a meat packing house at Waterloo, Ia., for Rath Packing Co., Waterloo. Estimated cost $100,000 to $150,000.

Packing Plant (Meat)—J. F. Decker & Son, Mason City, Ia., is receiving bids for a 6 story, 139 x 204 ft. addition to packing plant. Estimated cost $300,000. Henschien & McLaren, 1637 Prairie Ave., Chicago, Ill., are architects.

Packing Plant (Poultry Products)—Poultry Producers Assn., 700 Front St., San Francisco, Calif., awarded contract for a 100 x 200 ft. packing plant, to J. H. May, Napa, Calif.

Packing House—Cherokee Farm Products Co., Canton, Ga., will soon award contract for the construction of a 2 story, 55 x 85 ft. packing house. Estimated cost $20,000. E. C. Seiz, 165 Spring St., N. W., Atlanta, Ga., is architect.

Packing Plant—Cudahy Packing Co., 803 Macy St., Los Angeles, Calif., will soon award contract for the construction of a plant to include 3 story, 47 x 49 ft. addition to lard refinery, 1 story, 38 x 61 ft. hydrogen plant, 3 story, 44 x 73 ft. hydrogenerating building, etc. Private plans.

Packing Plant (Citrus Fruit)—Texas Citrus Fruit Growers Exchange, c/o J. Shary, Mission, Tex., is receiving bids for the construction of a 1 story, 96 x 125 ft. citrus fruit packing plant at La Feria. Estimated cost $75,000. Equipment will be required.

Packing Plant (Fruit Products)—Vita Fruit Products Co., Lodi, Calif., awarded contract for the construction of a 1 and 2 story packing plant to Davis-Pearce Co., Grant and Weber Sts., Stockton. Estimated cost $100,000.

Packing Plant Addition—California Conserving Co., Hayward, Calif., awarded contract for the construction of a 1 story, 100 x 200 ft. packing plant to Barrett & Hilp, 918 Harrison St., San Francisco. Estimated cost $60,000.